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Soil Survey
of
Adams County, Ohio

By

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and

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Bureau of Chemistry and Soils

In cooperation with the
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SOIL SURVEY OF ADAMS COUNTY, OHIO

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COUNTY SURVEYED

Adams County is in the southwestern part of Ohio (fig. 1). Ohio River forms its southern boundary. The total area of the county is 583 square miles, or 373,120 acres.

This county includes parts of two distinct physiographic regions [1]—the Appalachian Plateaus (locally known as the Allegheny Plateau), which extend into the county from 2 to 6 miles westward from the eastern county line; and the Interior Low Plateaus, lying west of the Appalachian Plateaus and embracing the remainder of the county. The Appalachian Plateaus section is featured by comparatively high narrow ridges, deep valleys with steep slopes, and a 300- to 400-foot escarpment along the western front, where it abruptly slopes to the lower rolling plains of the Interior Low Plateaus. That section of the Appalachian Plateaus in this county is maturely dissected, and the average depth of the valleys is about 550 feet. The range in elevation is from 600 to 1,300 feet above sea level.

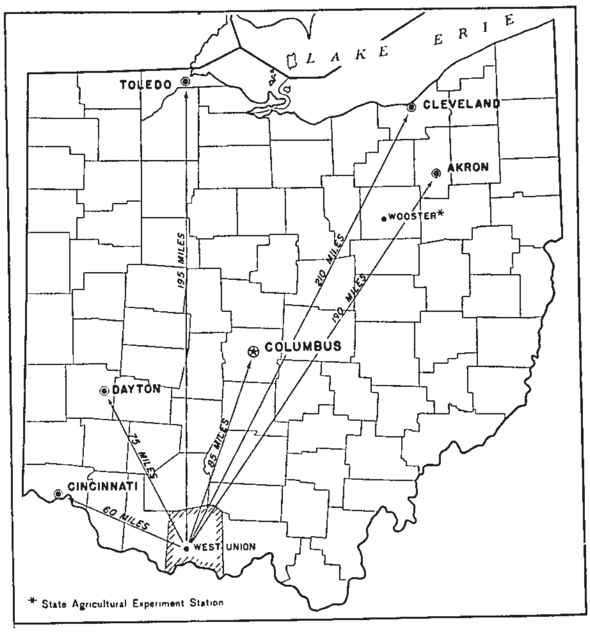

FIGURE 1.—Sketch map showing location of Adams County, Ohio.

The Interior Low Plateaus section consists of two belts: (1) A highly dissected belt, ranging from 4 to 7 miles in width, paralleling and extending back from Ohio River, where only narrow lime-

[1] Statements pertaining to geology and physiography are taken from an unpublished report on the geology of Adams County, Ohio, by L. G. Westgate.

stone and dolomitic limestone ridges, from 100 to 300 yards wide, mark the former level of plains (cuestas), and the steep-sided valleys range from 200 to 400 feet in depth; and (2) an area adjoining this belt on the north, where the ridges become gradually wider and the valleys less deep as they extend northward. The limestone ridges (remnants of Brassfield cuesta) in the vicinity of Fairview and the dolomitic limestone ridges (remnants of Niagara cuesta) about West Union are from one-fourth to 1 mile wide. North of these towns and continuing to the Highland County line, the erosional surface features have been modified by a blanket of glacial till, and the result is a broad glaciated plain cut by comparatively narrow shallow valleys, the floors of which range from 50 to 200 feet below the tops of the ridges. Rising a hundred feet or more above the general level, in the southern part of the glaciated plain, are Coon, Cave, Spencer, and other hills, remnants of the Niagara cuesta.

Lying between the glaciated plain and the Appalachian Plateaus section, in the north-central part of the county, is a highly faulted section of about 8 squares miles, consisting of short, narrow, and irregularly shaped ridges; comparatively deep, steep-sided, and narrow valleys; and different-sized intervening flats.

Cutting the Interior Low Plateaus section to a depth ranging from 300 to 500 feet, and having a width ranging from one-fourth to 1 mile, is Ohio Brush Creek Valley, which almost bisects the county in a north-south direction. With its tributaries it provides drainage for almost all of the northern part of the county, as well as the central and south-central parts. Drainage waters in eastern Adams County, particularly in the section occupied by the Appalachian Plateaus section, find their way to Scioto Brush Creek; and those of the southwestern part, largely to Eagle and Threemile Creeks. All the above-mentioned streams are tributaries of Ohio River. Extending back from Ohio River and the larger streams are intricate systems of smaller streams which ramify the uplands, affording drainage for practically every farm. Most of the smaller streams are intermittent, flowing rapidly in the spring but becoming dry in the summer. Along Ohio River the valley floor, which consists of level bottom lands, ranges from one-half mile to 2 miles in width. Scioto Brush Creek Valley ranges in width from one-fourth to one-half mile. Along Ohio Brush Creek well-defined terraces occur at two or three levels, and at one level remnants of an older terrace are distinguishable. When Ohio River is at high flood stage, the waters back up into the larger lateral valleys for a distance ranging from 1 to 5 miles.

As a part of the early agricultural development of Adams County, the settlers found it necessary to remove the virgin forests which, with the exception of small prairie areas, completely covered the county. A large part of the county, especially in the Appalachian Plateaus section, is still heavily timbered.

Adams County was formed in 1797. The first settlement[2] in the territory now included in the county was made in 1790, at Man-

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[2] HOWE, H. HISTORICAL COLLECTIONS OF OHIO . . . AN ENCYCLOPEDIA OF THE STATE. . . . 2 v., illus. Cincinnati. 1902.

chester, by Nathaniel Massie and 30 families. Many of the early settlers were from Virginia, Kentucky, and northern Ireland. During the last 25 years many Kentuckians have settled in the county, especially in the southern half. There are no large towns, and the entire population is classed by the census as rural. According to the census, the population has decreased gradually since 1900, when it was 26,328. The census of 1930 reports a total population of 20,381. The rough broken land in the eastern part of the county is more thinly populated than the rest.

West Union, the county seat, in the south-central part; Manchester, on the Ohio River; and Peebles, Seaman, and Winchester, along the Norfolk & Western Railway, are the principal towns. Lawshe, Beaver Pond, and Mineral Springs are shipping points along the Norfolk & Western Railway. In addition to the towns mentioned, many small villages with one or more stores serve local communities.

The county is below the average of Ohio counties in transportation facilities. The Norfolk & Western Railway crosses north of the center of the county, in an east-west direction. Manchester has a landing for river boats and a public ferry which connects with the Chesapeake & Ohio Railway on the Kentucky side. The recently completed series of dams and locks, which assures a minimum 9-foot water stage, allows river transportation to be carried on continuously.

Several State roads cross the county east and west, and United States Highway No. 52 follows the Ohio River across the southern part. Other State roads, extending north and south, connect Manchester, Bentonville, West Union, and Winchester in the western half. Peebles is connected with Locust Grove and Sinking Spring (Highland County) in the northeastern part, and with Marble Furnace and Seaman in the northern part. Macadamized roads reach most sections. When dry, the dirt roads can be used for automobile traffic. Most sections are served by rural mail routes and telephones. Cincinnati, Hillsboro, and Portsmouth, Ohio, and Maysville, Ky., are the principal outside markets.

CLIMATE

Adams County has in general a temperate continental climate, with short periods of extreme heat and cold. The long warm summers are favorable to the growth of corn and tobacco, and the low temperatures of winter generally are not destructive to winter-grown crops. The mean annual temperature of 52.7° F., at Peebles, is characteristic of the ridges and upper valley slopes, and that of 54.7° at Green, on the Ohio River terrace in the southeastern corner of the county, is characteristic of the terraces and bottoms along Ohio River.

The average annual precipitation at Peebles is 44.20 inches and at Green is 43.20 inches. In general, the rainfall is well distributed throughout the year. The annual snowfall is light. Occasionally excessively wet springs, when plowing and planting are retarded, and summer droughts, during which crops suffer severely from lack of moisture, are experienced.

Within the limits of the county marked differences in the length of the frost-free season exist. In most places differences in location with respect to air drainage are the contributory causes. The narrow ridges and upper valley slopes, where the cold air can drain off readily on a frosty night, have much longer frost-free seasons than the narrow valley floors and lower slopes, where the cold air accumulates. In the valley of Ohio River and its larger tributaries, however, heavy fogs modify the low temperatures. This condition exists at the United States Weather Bureau station at Green, which has an average frost-free season of 181 days, from April 22 to October 20, inclusive; whereas at Peebles the average frost-free season is 157 days, from May 8 to October 12, inclusive. Frost has occurred at Peebles as late as May 30 and as early as September 19 and at Green as late as May 15 and as early as September 30.

Another factor which delays time of planting and germination of seed in soils with poor drainage is the heavy spring rains, as the water-soaked soils remain very cold until late in the spring.

Tables 1 and 2, compiled from records of the United States Weather Bureau stations at Peebles and Green, respectively, give the more important climatic data.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Peebles, Adams County, Ohio*

[Elevation, 645 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1930)	Total amount for the wettest year (1935)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	33.9	76	−31	3.74	1 43	3.27	4.7
January	31.7	73	−26	4.10	4.28	4.18	7.7
February	34.0	76	−13	2.88	3.23	2.43	4.6
Winter	33.2	76	−31	10.72	8.94	9.88	17.0
March	42.2	82	−8	3 88	3.20	6.41	4.0
April	52.4	91	12	4.10	1.53	4.53	1.1
May	61.5	97	24	3.72	1.20	9.28	.0
Spring	52.0	97	−8	11.70	5.93	20.22	5.1
June	69.8	100	33	3.94	.57	5.15	0
July	73.6	102	41	4 40	3.46	8 67	0
August	72.0	103	34	4 41	3.73	8.25	0
Summer	71.8	103	33	12.75	7.76	22.07	0
September	65 9	100	27	3.10	2.92	3.50	0
October	54.8	95	17	3.02	.86	3.81	.3
November	40 5	78	6	2.91	1.71	3.57	1.2
Fall	53 7	100	6	9.03	5.49	10.88	1.5
Year	52 7	103	−31	44 20	28.12	63.05	23 6

TABLE 2.—*Normal monthly, seasonal, and annual temperature and precipitation at Green, Adams County, Ohio*

[Elevation, 500 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1895)	Total amount for the wettest year (1907)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	35.1	75	−13	3.31	3.43	4.31	3.7
January	33.7	76	−20	4.08	4.44	9.55	6.5
February	32.2	74	−24	3.29	.57	2.03	4.4
Winter	33.7	76	−24	10.68	8.44	15.89	14.6
March	44.8	93	−1	4.45	2.97	7.83	3.1
April	53.6	96	19	3.37	2.94	3.30	.6
May	64.1	98	29	3.94	2.18	3.83	(1)
Spring	54.2	98	−1	11.76	8.09	14.96	3.7
June	71.8	103	40	4.20	2.69	6.37	0
July	75.8	105	41	4.70	1.66	8.00	0
August	74.5	106	42	3.57	2.45	4.77	0
Summer	74.0	106	40	12.47	6.80	19.14	0
September	68.5	100	31	2.71	1.73	2.93	0
October	57.3	94	19	2.60	1.18	3.33	(1)
November	44.6	80	6	2.98	1.93	2.94	.7
Fall	56.8	100	6	8.29	4.84	9.20	.7
Year	54.7	106	−24	43.20	28.17	59.19	19.0

[1] Trace.

AGRICULTURE

Shortly after 1790 the first 30 white families, who settled near the present site of Manchester, produced corn, wheat, flax, and vegetables on the terraces and islands of Ohio River. From this time on corn continued to be the most valuable crop. About 1800, iron ore was discovered, and soon after smelting furnaces were built at the present sites of Cedar Mills and Steam Furnace School. These required considerable labor for handling the ore and in providing wood for charcoal. By 1820 the population had increased to 10,406.[3] Naturally, the early agriculture was carried on in support of the iron industry, in addition to providing necessities for the farm family.

According to State reports [4] and the Federal census reports, during the decade, 1850–59, almost as many acres were devoted to corn and decidedly more to wheat and oats than in 1929. Federal census reports from 1880 to 1930 show that, until 1919, the acreage of corn remained about the same, but decreased about 12,000 acres in 1929. The average acre yield has increased from 24 bushels in 1879 to 29 bushels in 1929. According to the census reports for the last 50 years, the average acre yield of wheat has remained at about 11

[3] HOWE, H. See footnote 2.

[4] LLOYD, W. A. FALCONER, J. I., and THORNE, C. E. THE AGRICULTURE OF OHIO. Ohio Agr. Expt. Sta. Bull. 326, 441 pp., illus. 1918.

bushels. The maximum acreage, 28,637, was recorded for 1899 and the minimum, 10,747, for 1929.

In order of their importance, the crops now grown are corn, tobacco, wheat, hay, oats, potatoes, and rye.

Corn occupies a greater acreage than any other field crop. The 1935 Federal census reports that 36,056 acres were planted to corn in 1929, and that the corn from 35,615 acres was harvested for grain, with a yield of 923,195 bushels. The rest was cut for fodder, was hogged or grazed off, or was cut for silage. Yellow Clarage is the leading variety. Sweet corn, mainly of the Adams Early variety, together with some Golden Bantam, Country Gentleman, and Evergreen varieties, is grown along Ohio River, pulled green, and marketed in Cincinnati.

In 1929, tobacco, which ranks next to corn in importance, was grown on 5,065 acres, and the average acre yield, the highest recorded by the Federal census since 1879, was 911 pounds. In 1934 the acreage was 2,680 and the average acre yield, 818 pounds. The most extensively grown variety is White Burley, and other varieties are Kelley, Pepper, Hallie, Judy Pride, and Canadian Broadleaf. Farmers who grow tobacco are trying to develop a thin-fibered, light-colored, lightweight leaf with a mild flavor and mild odor.

Wheat, the cereal crop second in value, was grown on 14,914 acres in 1934 and yielded 187,204 bushels. It is grown as a cash crop, and most of it is shipped out of the county. Trumbull is the leading variety, and Poole, Fulhio, and Nigger are also grown. Many farmers consider wheat growing commercially unprofitable, owing to the low market price and the comparatively low yield, in addition to the disastrous work of insects and various fungus diseases and to winter-killing. The value of wheat as a nurse crop for clover and as a winter cover crop would seem to warrant its retention in the customary rotation of corn, wheat, and mixed timothy and clover.

The acreage in oats and the average acre yield are lower than in counties either farther north or farther south. This is largely because Adams County is too far south for spring varieties and too far north for winter varieties, also because of the fact that, in general, the soils of this county are not particularly suited to oats. This crop was grown on 469 acres in 1934, and rye was grown on 348 acres.

Potatoes and general truck crops for the Cincinnati and Portsmouth markets are grown on the Ohio River terraces and flood plains. The 1935 census reported a production of 34,667 bushels of potatoes from 483 acres in 1934.

Hay ranks next to corn in acreage. In 1934, 21,903 acres were devoted to hay and forage crops with a yield of 19,690 tons. Two-thirds of the acreage was sown to timothy and clover mixed, followed in order by timothy, clover, and alfalfa. Sweetclover is grown on steep slopes, where the soils are neutral, for pasture and for the prevention of erosion. Timothy and alsike are usually grown on poorly drained soils, but timothy and mammoth or medium red clover are more commonly grown on fairly well drained and well-drained soils.

Adams County reported about 1,000 acres in soybeans in 1931. Many farmers are introducing soybeans into the rotation which consists of corn or corn and soybeans, soybeans, wheat, and clover. The beans are sown in the cornfields, both for hogging down and for silage, and when grown separately they are used for both hay and seed. When clover fails, they are sometimes sown at corn-planting time and harvested for hay or seed in the fall.

A few farmers in all parts of the county supplement general farming with commercial fruit growing to some extent. The largest commercial orchard is on Peach Mountain. Apples are the principal fruit grown, followed by peaches. Orchards situated on upper valley slopes or on ridges, where the air drainage is favorable for escaping late killing frosts of spring, where the subsoils are friable and well drained, and where proper attention is given to tillage, pruning, spraying, and fertilizing, return good yields. Most of the fruit is hauled by autotruck to Portsmouth, Ohio, or Maysville, Ky. The 1935 census reports 40,890 bearing apple trees, 27,991 peach trees, 2,830 pear trees, 3,830 plum trees, and 3,269 grapevines.

Complete mixed fertilizers are commonly used on the soils of the uplands and stream terraces, but the soils on the flood plains are seldom fertilized. The 1930 census reports a total expenditure for fertilizer in 1929 of $132,293 on 1,961 farms, or an average of $67.46 a farm reporting. A 2–12–2 [5] mixture is probably used more than any other on land used for corn and wheat, although superphosphate and complete fertilizers, such as 2–12–4 and 2–12–6, are used extensively. A 3–8–6 mixture is preferable for tobacco. Farmers differ greatly as to the quantities of fertilizer to be applied, but the more common acre applications are 125 pounds, applied in the row at planting time, for corn and wheat; and 250 or 280 pounds for tobacco. Apple and peach trees receive 5 pounds of sodium nitrate to each tree. Special fertilizers are used for potatoes and truck crops. Pulverized limestone, or its equivalent in some other form of lime, is used to a small extent. On the more acid soils, lime is essential for good results with clover, and the yields of grain and other crops are decidedly increased through its use. The average acre application of lime is approximately 2 tons, the quantity depending on the degree of acidity of the soil and the kind of crop to be grown.

Dairying is the most important branch of agriculture. A few large purebred dairy herds are kept, but by far the greater proportion of the dairy cattle are grade animals, principally Jersey. Holstein-Friesian, Guernsey, and the dairy strain of Shorthorn are not uncommon. The herds are being improved through the use of purebred sires. Most of the herds are small, including from 4 to 12 cows, but some, particularly in the northwestern quarter of the county, include from 20 to 80 head.

A large proportion of the dairy products is sold by the farmers as whole milk and cream, which are collected at the farms and conveyed by truck to Cincinnati, Portsmouth, or creameries outside the county. Where cream is sold, the skim milk is fed to hogs.

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[5] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

On January 1, 1935, the number of cattle was 19,304, of swine was 12,978, of horses was 4,652, and of mules was 810.

Beef cattle are fed for market, principally in the northern half of the county. They are shipped in from western points in the fall, fed during the winter, and marketed in the spring. A few farmers breed beef cattle which, ranked according to numbers, are Shorthorn, Aberdeen Angus, and Hereford.

Probably 20 percent of the farmers raise hogs for the market. Duroc-Jersey is the most important breed, followed by Poland China, Ohio Improved Chester White, and Hampshire. A few farmers keep sheep. Merino is the most important breed, but some farmers have Shropshire, Hampshire, and Oxford breeds. Some horses are raised, as many farmers breed their working mares and raise enough work animals for their own use. Most of the sires are Percherons or Belgians.

Poultry raising is important on most farms. Flocks ranging from 50 to 100 chickens are common. A small proportion of the poultry is produced on specialized poultry farms where White Leghorn is the favorite breed. The average farmer keeps a mixture of Plymouth Rocks, Rhode Island Reds, and Wyandottes. Most of the eggs and chickens are sold on the farms and are conveyed by truck to the Cincinnati markets.

Dating from a period shortly before the World War and continuing until 1930, farm labor was scarce, owing mainly to the higher wages and shorter hours offered by manufacturers in Cincinnati and Portsmouth and by road contractors; but since that time labor has become more plentiful, as many people returned to the farms when the factories in the cities closed. In general, the members of the farmer's family do most of the work, and when extra help is needed, as during threshing time, exchange of help among neighbors is common.

The average size of farms, according to the Federal census reports, gradually decreased from 116 acres in 1880 to a minimum of 88.2 acres in 1920; but since that time it has increased and in 1935 was 101.1 acres. The increase was brought about by the fact that many farmers who wished to extend their farms bought adjacent land at mortgage or delinquent-tax sales.

The common terms of rental are for the landlord to furnish the commercial fertilizer and part of the livestock and seed and pay one-half of the threshing bill, in return for which he receives one-half of the income. According to the 1935 census report, 65.3 percent of the farms were operated by owners, 5.9 percent by part owners, 28.7 percent by tenants, and 0.1 percent by managers.

Although many of the country homes are modern and up to date, farm buildings in general are of old styles, but they are substantially built, are kept painted, and are in good repair. The barns provide ample room for housing the livestock and storing crops for winter feeding. The work animals are heavy draft horses and mules. The same census gives the average value of farms, including buildings, as $2,555, or $25.27 an acre.

Lumbering is an important industry in the more hilly sections in the eastern and southern parts of the county. In addition to the small mills, which operate in nearly all the towns, a score or more

of small portable mills are operating in the woods. Besides cutting saw logs for the mills, many cross ties, poles, and locust posts are hauled by truck out of the county. Black walnut is sold for veneer. The value of all forest products sold in 1934 was $10,612.

At Peebles, limestone is crushed for road surfacing, is ground as agricultural lime, and some is shipped to steel plants at Kenova, W. Va., and elsewhere for fluxing. In some neighborhoods, during dull periods, the farmers grind limestone with small portable machines for agricultural use.

SOILS AND CROPS

The soils of Adams County have developed under the influence of a humid temperate climate and a predominantly deciduous forest cover and are, for the most part, light colored. The soil material of about 65 percent of the area has accumulated in place from the underlying rocks through the processes of weathering, of 25 percent through glacial processes, of 9 percent by deposition of alluvium, and of 1 percent by deposition of colluvial material.

The county lies within two physiographic provinces—the Appalachian Plateaus and the Interior Low Plateaus. In the Appalachian Plateaus section, which is an extremely dissected area extending over most of the eastern part of the county, very fine grained noncalcareous sandstones largely cap the numerous ridges and noncalcareous shales prevail on the valley slopes. In the Interior Low Plateaus section, which occupies the rest of the county, dolomitic limestone caps both broad and narrow ridges and calcareous shales cover the steep valley slopes in the central part; limestones cap the narrow ridges, and interstratified shales and limestones constitute the formation on the steep valley slopes in the southwestern part; and in the northwestern part, limestone and shale formations are covered with a blanket, ranging from 1 to 40 feet in thickness, of glacial till, and here the relief is predominantly undulating or gently rolling. In the north-central part of the county is an area of 8 square miles, where noncalcareous sandstones and noncalcareous shales have been brought into contact with dolomitic limestones, limestones, and calcareous shales through intense faulting. Here the relief ranges from undulating to extremely rough and broken, ridges are capped by either sandstone or shale, and the slopes are underlain by either noncalcareous or calcareous shale formations.

Under the processes of weathering, the noncalcareous sandstone (Waverly) disintegrates into brown acid silt loam material; and the noncalcareous shales (Ohio) develop into gray acid silty clay and silty clay loam materials. Cedarville dolomite, the dolomitic limestone lying farthest east, is massive, gray, and readily breaks into blocky fragments ranging in diameter from one-half inch to 6 inches. These fragments disintegrate further and on decomposing become calcareous silt loam material. Bisher dolomite, which lies west of the Cedarville dolomite, is a hard, well-bedded, yellow, coarse-grained dolomitic limestone that first breaks down to sandy material composed largely of small dolomitic crystals and later to calcareous silt loam. The shale associated with these dolomitic limestones develops into gray heavy calcareous silty clay or silty clay loam ma-

terials. The calcium limestones develop into calcareous reddish-brown silt loam; and the shale associated with Richmond limestone develops into gray calcareous silty clay or silty clay loam. In places where the Richmond shale and limestone are interbedded, as on steep valley slopes, the gray color and heavy texture prevail where the shale predominates, but where the limestone is dominant the color is reddish brown and the texture is lighter. The unweathered glacial till consists of gray or brown calcareous material, and this, also the dolomitic limestone and calcareous shale materials, through leaching, first become neutral and subsequently acid.

Where soil materials have remained for long periods on smooth upland surfaces under well-drained conditions, as over ridges of limestone, dolomitic limestones, and sandstone, level and undulating areas of Illinoian drift, or high stream terraces, soil profile characteristics more or less normal to soils of this climatic and vegetative environment have been developed; but where the slopes are comparatively steep, as are the shale slopes, only a partial development of the normal soil characteristics has taken place, partly because of greater run-off, less leaching, and a smaller amount of water in the soil for the growth of plants chiefly responsible for soil development, and partly because of increased erosion.

With the exception of very small areas of dark soil materials over the marl member of the Cedarville dolomite and very small areas where drainage has been restricted, the soils of Adams County are light in color, low in organic matter, and those on smooth, gently sloping, or level surfaces, are acid. The light color is due to their development under a dense forest cover, which was unfavorable for large grass rooting systems and, therefore, for the accumulation of much organic matter in the soil. Upland soils derived from Waverly sandstone and Ohio shale materials are very acid and have acid substrata, but other soils of the county have calcareous substrata.

In the uplands a close relationship exists between geologic formations, relief, and soils. Over the hard rock formations (limestone and sandstone) and glacial till, broad gently sloping ridges and plateaus occur, which are favorable for cultivation; but steep slopes prevail over the shale formations, and erosion is pronounced, so that tillage is accomplished with difficulty. A general relationship exists between the soils, particularly the parent materials, and the physiographic regions of the county. The upland soils of the Interior Low Plateaus section are developed in part from limestone, dolomitic limestone, and calcareous shale materials, and in part from Illinoian till materials, the latter being confined to the northwestern quarter of the county. In the Appalachian Plateaus section, the upland soils are developed from noncalcareous sandstone and noncalcareous shale materials. Soils developed from alluvium are well distributed throughout the county.

A very close relationship exists between the character of the natural forest growth [6] and the soils, the most general and obvious

[6] Names of trees used in this report have been taken from the following: BRAUN, E. L. THE VEGETATION OF THE MINERAL SPRINGS REGION OF ADAMS COUNTY, OHIO. Ohio Biol. Survey Bull. 15, v. 3, no. 5, pp. [383]–517, illus. 1928; and from OHIO AGRICULTURAL EXPERIMENT STATION, FORESTRY DEPARTMENT. FOREST SURVEY OF ADAMS COUNTY, OHIO. Unpublished report.

contrast being between the flora of the Interior Low Plateaus section and that of the Appalachian Plateaus section, a contrast which is definitely correlated with differences in soils.

In the Interior Low Plateaus section, on brown or brownish-gray fairly well drained or well-drained soils derived from limestone and dolomitic limestone, which in many places are interbedded with calcareous shale, the virgin forests on undulating or gently rolling land consist dominantly of white, red, shingle, chinquapin, swamp white, and bur oaks, white ash, and blue ash, in association with less numerous trees, such as scarlet oak, tuliptree, black oak, chestnut oak, shellbark hickory, sour gum, red elm, sugar maple, mockernut hickory, mulberry, dogwood, papaw, red maple, and wild cherry. On the eroded, stony, steep, and colluvial soils the tree growth consists of white ash, tuliptree, beech, sugar maple, buckeye, basswood, black walnut, redbud, butternut, red elm, and chestnut oak, and where the limestone or dolomitic limestone is near the surface, arborvitae grows. An area of Bratton silt loam underlain by soft marl supports a growth of cedar, arborvitae, and prairie grasses. On poorly drained gray upland flats white oak is the dominant tree, associated with chestnut, pin, and swamp white oaks, red elm, white elm, red maple, sweetgum, sour gum, shellbark hickory, beech, white ash, sassafras, and dogwood. On steep valley slopes in the southwestern and northwestern quarters of the county, where the soil materials have been derived from interstratified shales and limestones, the tree growth is principally black locust, sugar maple, beech, white oak, red oak, tuliptree, and red elm, together with some honeylocust, wild cherry, dogwood, and red cedar in places where the limestone is near the surface. A volunteer growth of black locust covers these slopes after the fields are abandoned.

Well-drained brown alluvial soils of the Interior Low Plateaus section support a dominant growth of sycamore and willow and a less abundant growth of cottonwood, soft maple, silver maple, white ash, black walnut, sugar maple (sugar tree), boxelder, and buckeye; whereas the gray poorly drained flood-plain soils support a growth of sycamore, soft maple, white elm, and willow. Soils of the well-drained terraces of the Interior Low Plateaus section support a dominant growth of butternut, buckeye, sugar maple, white ash, basswood, tuliptree, and black walnut; and a less abundant growth of spicebush (sweet birch), witch-hazel, dogwood, beech, cedar, hemlock, scarlet oak, blue ash, and red elm.

The Appalachian Plateaus section is at present the most heavily forested part of the county. About 40 percent of it, according to the Ohio State Forestry Department, is covered with mixed hardwoods, 10 percent supports a growth of mixed hardwoods and pines, and 20 percent has been burned over by rather recent forest fires. In the southeastern and east-central parts, on this plateau, are 6,416 acres in the Shawnee State Forest. Most of this forest is on soils overlying noncalcareous sandstone, and a smaller part overlies noncalcareous shales.

The trees on soils occupying shale slopes in the Appalachian Plateaus section are mainly scarlet, chestnut, post, white, and red oaks, sour gum, red maple, sugar maple, and hickory; and less abundant trees are chestnut, white ash, pignut hickory, Juneberry, beech, witch-

hazel, Jersey pine, black oak, butternut, blackjack oak, sourwood, sumac, yellow locust, sassafras, and shellbark hickory. The undergrowth is huckleberry, blueberry, and smilax.

On the soils derived from shale, which occur on the steep ravine walls, the principal trees are red maple, chestnut, dogwood, beech, tuliptree, and sour gum, and the less abundant trees are sugar maple, Juneberry, shellbark, shagbark, and pignut hickory, white ash, witch-hazel, black walnut, sweetgum, red mulberry, sourwood, sycamore, wild cherry, white, scarlet, red, black, chestnut, blackjack, and post oaks, sassafras, white elm, red elm, hackberry, redbud, red ash, and basswood. The principal trees on soils of the upper slopes and ridges, underlain by sandstone, are black, white, scarlet, red, and chestnut oaks, and chestnut, with some shortleaf pine in the southeastern corner of the county, and the less abundant trees are tuliptree, sugar maple, black walnut, shellbark hickory, sourwood, black gum, sassafras, Juneberry, pignut hickory, dogwood, beech, aspen, blackjack oak, yellow locust, and sumac. At the heads of numerous valleys and ravines, the dominant tree growth is tuliptree, basswood, white ash, shellbark hickory, red gum, beech, and sugar maple. Where the soil is very droughty, as on the narrow ridges, blackjack, post, scarlet, and chestnut oaks, and scrub, shortleaf, and pitch pines predominate.

The adaptation of soils to crops is generally understood by the farmers of this county, and this principle is applied as far as economic conditions will allow. For example, it is generally recognized that tobacco does best on the brown well-drained soils, particularly those having a neutral reaction and commonly occurring on steep slopes or bottoms along streams; that corn does well on dark-brown well-drained soils but yields best where these soils have a neutral reaction, as on first bottoms along streams or in low upland depressions; and that wheat does well on fairly well to well-drained grayish-brown or brown soils. Timothy and alsike clover, owing to their comparatively high resistance to excess moisture and acidity, largely comprise the hay grown on the poorly drained soils and most of that grown on the brown acid soils; although mammoth and white clover are often substituted for alsike. Bluegrass, the chief permanent pasture grass, also alfalfa, sweetclover, and red clover, do best on the neutral or alkaline soils of the valley slopes or first bottoms along streams.

On the bases of their most important characteristics the soils of the county may be considered as belonging to five groups: (1) Brown well-drained soils of the uplands (2) grayish-brown soils of the uplands; (3) gray poorly drained soils of the uplands; (4) brown soils of the terraces and bottom lands; and (5) grayish-brown poorly drained soils of the terraces and bottom lands. This grouping has a definite relationship to the agricultural use and productivity of the soils.

The soils of the county are placed in series on the basis of differences in structure, color, consistence, and other features of the soil profile, and the source, character, and process of accumulation of the material from which the soils have developed. A further differentiation into types has been made on the basis of the texture of the surface soil. Minor variations in the soil, not sufficient to produce type or series differences, are indicated as soil phases. The distribu-

tion of the soils is shown on the accompanying map, and their acreage and proportionate extent are given in table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Adams County, Ohio*

Type of soil	Acres	Percent	Type of soil	Acres	Percent
Bratton silt loam	22,720	6.1	Rarden silt loam	2,816	0.7
Bratton silt loam, slope phase	9,408	2.5	Tilsit silt loam	640	.2
Bratton stony silt loam, steep phase	15,936	4.3	Fawcett silt loam	4,224	1.1
Bratton silty clay loam, colluvial phase	2,752	.7	Muskingum silt loam	3,072	.8
Hagerstown silt loam	7,168	1.9	Muskingum silt loam, deep phase	2,880	.8
Cedarville silt loam	7,680	2.1	Muskingum silt loam, steep phase	13,184	3.5
Cedarville silt loam, shallow phase	192	.1	Muskingum silt loam, very steep phase	41,664	11.2
Cincinnati silt loam	8,640	2.3	Muskingum silt loam, colluvial phase	256	.1
Maddox silt loam	2,176	.6	Clermont silt loam	640	.2
Ellsberry silt loam	320	.1	Avonburg silt loam	2,304	.6
Ellsberry silty clay loam	2,752	.7	Burgin silty clay loam	640	.2
Bentonville silt loam	10,432	2.8	Wheeling silt loam	4,032	1.1
Bentonville silt loam, slope phase	1,984	.5	Wheeling silt loam, slope phase	1,088	.3
Jacksonville silt loam	2,368	.6	Wheeling sandy loam	64	.1
Eden silt loam	832	.2	Huntington silt loam	10,176	2.7
Fairmount silty clay loam	6,720	1.8	Huntington silt loam, colluvial phase	1,088	.3
Fairmount silty clay loam, colluvial phase	384	.1	Huntington silt loam, high-bottom phase	832	.2
Eden silty clay loam	8,640	2.3	Huntington fine sandy loam	64	.1
Heitt silty clay loan	15,296	4.1	Williamsburg silt loam	3,200	.8
Heitt silt loam	7,488	2.0	Williamsburg silt loam, mottled-subsoil phase	384	.1
Otway silty clay loam	12,928	3.5	Williamsburg silt loam, slope phase	384	.1
Otway silty clay loam, smooth phase	896	.2	Dunkinsville silt loam	576	.2
Otway silty clay loam, gullied phase	5,120	1.4	Genesee silt loam	6,720	1.8
Otway silt loam	1,536	.4	Pope silt loam	4,160	1.1
Rossmoyne silt loam	7,488	2.0	Pope silt loam, high-bottom phase	960	.3
Loudon silt loam	19,520	5.2	Pope gravelly silt loam, colluvial phase	3,008	.8
Loudon silt loam, slope phase	3,392	.9	Sciotoville silt loam	832	.2
Jessup silt loam	8,960	2.4	Philo silt loam	640	.2
Edenton silt loam	20,480	5.5	Ginat silt loam	256	.1
Colyer silt loam	15,040	4.0	Chilo silty clay loam	64	.1
Colyer silt loam, deep phase	704	.2	Lindside silt loam	2,432	.6
Colyer silt loam, steep phase	23,296	6.2	Eel silt loam	3,008	.8
Naceville silt loam	2,048	.5			
Naceville silt loam, slope phase	512	.1	Total	373,120	
Latham silty clay loam	192	.1			
Latham silty clay loam, steep phase	832	.2			

BROWN WELL-DRAINED SOILS OF THE UPLANDS

The brown well-drained soils of the uplands, which have level, undulating or gently rolling relief, are, with proper care, comparatively free from serious erosion, have friable mellow silt loam surface soils and friable well-aerated subsoils whose consistence and structure are favorable for conserving moisture, mineral elements, and nitrogen. All these soils are easy to cultivate and warm early in the spring, and crops on them respond quickly to the addition of barnyard manure, to the turning under of green-manure crops, and to commercial fertilizers. Probably 90 percent of the land occupied by them is under cultivation.

Where the brown well-drained soils occupy steep valley slopes, only those occurring throughout the Interior Low Plateaus section are cultivated. They are neutral or slightly alkaline, are naturally well supplied with available mineral elements and nitrogen, and are underlain by limestone or interstratified beds of limestone and shale. Because of these characteristics, together with their favorable tex-

ture and consistence of both surface soil and subsoil, such soils are selected for the production of lightweight bright-leaf tobacco. On these slopes the prevention of erosion is a serious problem. Therefore the fields are cultivated about once in 5 years and allowed to remain in bluegrass pasture the rest of the time. The steep valley slopes underlain by noncalcareous shales or noncalcareous sandstones, as are the soils of the Appalachian Plateaus section, are almost entirely uncleared and support a forest cover.

Soils of the Bratton, Cedarville, and Hagerstown series belong to the group of well-drained brown soils with generally level or gently rolling relief, and they are derived from limestone or dolomitic limestone materials, with a small admixture of calcareous shale. Cincinnati silt loam is developed from deeply weathered glacial till.

Bratton silt loam.—Bratton silt loam caps a broad belt of broken ridges, at the foot of the western escarpment of the Appalachian Plateaus, extending northeast and southwest across the county, from a point near Manchester and Wrightsville on the Ohio River to the Highland County line north of Loudon.

The cultivated soil, to a depth of 8 inches, is reddish yellowish-brown slightly acid friable mellow silt loam. This is underlain by light reddish-yellow somewhat heavier acid silt loam which, at a depth of about 13 inches, grades into silty clay loam that readily breaks into irregularly shaped blocks, ranging in size from that of a flaxseed to that of a chestnut. Below a depth of 25 inches the lumps are slightly larger, the texture is heavier, and black manganese and iron concretions, streaks, and coatings are present. This material extends to a depth of about 60 inches, where the material is neutral, and many dolomitic crystals, resembling quartz sand, and irregular fragments of dolomitic limestone are present.

In places on slopes and narrow ridges, where erosion has been active, the surface layer is partly or entirely removed and the soil material consists of reddish-brown silty clay loam. At the bases of slopes or in depressions, the yellowish-brown silt loam surface soil may be 12 or 13 inches thick. Between Seaman and Jessup and around Loudon are a few small areas, associated with soils derived from glacial materials, where small glacial rocks are on the surface and are embedded in the surface soil and upper part of the subsoil, but in other characteristics these areas resemble the typical soil. North of Dunkinsville and at a few other places west of Ohio Brush Creek Valley are small flat areas, aggregating less than one-half square mile in extent, which are equivalents of Bedford silt loam but are included with Bratton silt loam in mapping. The soil in these areas differs from Bratton silt loam in that the upper part of the subsoil is yellowish brown and the lower part is brownish yellow, indicative of somewhat restricted internal drainage. The crops grown and yields correspond to those on the typical soil.

Another variation of Bratton silt loam occurs in a belt about 4 miles wide extending northward from Dunkinsville and Fawcett into Highland County. South of Jacksonville in the vicinity of Hoop Ridge School and at many other places, limestone sinks, ranging from 10 to 300 feet in diameter and from 10 to 30 feet in depth, dot the surface of this soil. In such places erosional surface features result largely from surface waters draining into the sinks.

This included soil resembles the slope phase of Bratton silt loam, in that it has been denuded of part, in places of all, of its surface soil through sheet erosion; but it differs, in that it has more of the light reddish-yellow and yellow colors in the surface soil and subsoil, owing to the influence of shale from a substratum of interstratified shale and dolomitic limestone. About 70 percent of this land is under cultivation, and the remainder is used largely for permanent and woodland pastures. Owing to a thinner surface soil, lower organic-matter content, and somewhat restricted subsoil drainage, corn, wheat, and timothy do not yield so well as on the more typical Bratton silt loam. Tobacco and clover do well in places where, owing to erosion, the neutral soil material has been exposed at the surface.

Bratton silt loam is among the more important farming soils. It is a mellow easily tilled soil, has most favorable relief, and has good surface and internal drainage. About 90 percent of it is cultivated. About 28 percent of the cultivated land is used for corn, 22 percent for wheat, 16 percent for meadow, 14 percent for pasture, 3 percent for tobacco, 1 percent for orchards, and 6 percent for potatoes, vegetables, oats, rye, and soybeans. Of the uncultivated land, about one-half is used for pasture, one-fourth for wood lots, and one-fourth for buildings and barn lots.

The principal type of farming on this soil is a combination of general farming and growing tobacco as a cash crop. Almost all of the corn and hay and part of the wheat produced are fed to livestock on the farm, and the rest of the wheat is sold. Corn yields average about 30 bushels an acre, but when the season is favorable and the best methods of tillage and fertilization are practiced, yields of 45 bushels are not uncommon. Tobacco averages 900 pounds, wheat 11 bushels, and potatoes 100 bushels.

A common rotation followed is corn or tobacco for 1 year, succeeded the following year by wheat, and this the third year by mixed timothy and clover, which is often left for 2 years, being used for hay the first year and for pasture the second. The clover and timothy sod is broken early in the spring for corn. An acre application of 200 pounds broadcast or 125 pounds in the row of 2–12–2, 2–14–4, or 2–12–6 fertilizer is used for corn and 200 pounds for wheat. An acre application of 200 pounds of 3–8–6, 2–14–4, or 2–12–6 is commonly used for tobacco, although the better farmers use from 50 to 100 percent heavier applications of fertilizer than the average. Little stable manure is available. Soybeans are grown by some farmers and return an acre yield of about 12 bushels of beans or 1 ton of hay.

Bratton silt loam, slope phase.—Very closely associated with Bratton silt loam, on the more sloping parts of ridges, is a slope phase of this soil. Within its boundaries are many limestone sinks ranging from 10 to 300 feet in diameter and from 5 to 30 feet in depth. In many places the waters which erode the sink walls and the immediately surrounding land drain into the sinks.

This soil is similar to typical Bratton silt loam, except that a part of, and in places all, the surface soil has been carried away by sheet erosion, leaving the reddish-brown heavy silt loam at the surface, thereby greatly reducing the productivity of the land. A few small areas of this soil near Jessup have some glacial material in the upper

part of the subsoil and in the surface soil, as evidenced by the presence of crystalline erratics.

Bratton stony silt loam, steep phase.—Bratton stony silt loam, steep phase, occurs as long narrow areas on 25 to 100 percent upper valley slopes, adjacent to and just below areas of the slope phase of Bratton silt loam. The areas include numerous outcrops of Bisher dolomite, in many places occurring as cliffs. This soil consists of a very stony neutral yellowish-brown, reddish-brown, or dark reddish-brown silt loam, silty clay loam, or silty clay colluvial soil material which has slumped from the dolomitic limestone formations and Bratton silt loam, slope phase. Below the cliffs the material rests, at a depth ranging from 2 to 5 feet, on calcareous Crab Orchard shales which have a silty clay texture. The land is not cultivated.

Bratton silty clay loam, colluvial phase.—Bratton silt clay loam, colluvial phase, occurs on valley slopes, intermingled with and immediately below the steep phase of Bratton stony silt loam, but it is unlike that soil in its less sloping relief, its freedom from dolomitic outcrops, and in having less rock fragments scattered over the surface. The topmost layer of this soil, ranging in thickness from 2 to 4 feet, consists of material slumped or washed from Bratton silt loam, slope phase, and dolomitic limestone formations which fringe the upper edges of the valleys.

The surface soil, to a depth of 8 inches, is dark reddish-brown friable heavy silt loam or light silty clay loam. This rests on friable reddish-brown silty clay loam and this, in turn, on heavy calcareous olive-gray Crab Orchard shale materials. In places limestone fragments are scattered over the surface, and they interfere seriously with cultivation.

This soil is not extensive but is reported by the farmers to produce a thin-fibered, light-colored, mild-tasting, and mild-smelling tobacco of a decidedly superior grade. The soil is also well adapted to alfalfa, corn, and bluegrass.

Hagerstown silt loam.—Areas of Hagerstown silt loam occur west of the main belt of Bratton silt loam and continue almost to the Brown County line, covering many long narrow limestone ridges. The land is naturally well drained. This soil is comparable to Bratton silt loam as an agricultural soil and also in its natural soil characteristics, except that it has more red color throughout and a somewhat heavier texture in the lower part of the subsoil.

The surface soil, to a depth of 8 inches, is reddish-brown friable silt loam. This is underlain by light reddish-yellow or light reddish-brown silty clay loam which, at a depth of about 40 inches, grades into brownish-yellow silty clay containing olive-colored mottlings.

Northwest of Bentonville and to less extent throughout the southwestern part of the county where Hagerstown silt loam is developed, are areas of heavier soil in which the influence of shale is more pronounced. Therefore the soil material differs from the typical soil, in that it is heavier throughout, and the lower part of the subsoil is olive-yellow calcareous silty clay. Some areas just south of Bentonville have a heavy yellow subsoil. In these areas the soil differs from typical Hagerstown silt loam in having a brownish-yellow upper subsoil layer and a mottled brown, yellow, and gray heavy silty

clay loam lower subsoil layer. Owing to poorer internal drainage somewhat lower crop yields are obtained than on typical Hagerstown silt loam. In the vicinities of Spencer Hill and Seaman are small areas, closely associated with glaciated Maddox soils or Cincinnati silt loam, where glacial soil material, as evidenced by crystalline erratics, comprises more or less of the surface soil and upper part of the subsoil; but below this the profile is the same as that of Hagerstown silt loam.

The percentage of the acreage cultivated and devoted to various crops, the crop yields, and the farm practices are about the same as for Bratton silt loam.

Cedarville silt loam.—Cedarville silt loam occurs in the Appalachian Plateaus section on the lower slopes of valleys which have been cut down into Cedarville dolomite. The soil is derived from the marl member of this formation, with a very low content of Ohio shale material. The shale material is noncalcareous and is washed or slumped from the steep slopes of the Ohio shale formation which is immediately above the Cedarville dolomite.

The surface soil of Cedarville silt loam consists of brown, grayish-brown, or yellowish-brown silt loam underlain, at a depth of about 8 inches, by a grayish-brown or yellowish-brown silt loam layer about 4 or 5 inches thick. This material grades downward into heavy reddish-brown silty clay loam which, at a depth ranging from 18 to 24 inches, rests on disintegrated dolomitic limestone particles (commonly known as marl). As mapped, many small areas of Cedarville silt loam, shallow phase, are included.

Probably 70 percent of this soil is cultivated, and the rest is used for permanent and woodland pastures. Owing to the proximity of the disintegrated dolomitic limestone to the surface, the soil is inclined to be droughty, but during wet seasons, yields of corn, tobacco, and wheat are comparable to those produced on Bratton silt loam. Where erosion has exposed or has brought the neutral soil material near the surface clover does well.

Cedarville silt loam, shallow phase.—Numerous small areas of Cedarville silt loam, shallow phase, the larger of which have been mapped, occur throughout the Cedarville silt loam areas. Soil of the shallow phase differs from the typical soil in that the surface soil, to a depth of 6 inches, is friable pervious very dark grayish-brown slightly alkaline silt loam or loam. This is underlain by irregularly shaped particles (commonly called marl) ranging in size from that of peas to that of potatoes, and resulting from the disintegration of the underlying dolomitic limestone which occurs at a depth ranging from 12 to 24 inches.

Owing to its erosibility and droughty character, this soil is not farmed, but it supports a scattered growth of red cedar (arborvitae) and a cover of prairie grasses.

Cincinnati silt loam.—Cincinnati silt loam is a well-drained soil derived from Illinoian till material and featured by undulating or gently rolling relief. It occurs as numerous narrow rolling ridges and in larger bodies on fairly broad divides where the relief is strongly undulating and sloping.

The surface soil to a depth of 8 inches is brown friable slightly acid silt loam underlain by acid light-brown heavy silt loam which grades,

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at a depth of about 14 inches, into acid yellowish-brown silty clay loam mottled with gray and yellow at a depth of 24 inches. This material continues downward to a depth of about 45 inches, where it is underlain by olive-gray, olive-yellow, and olive-brown neutral silty clay containing some manganese and iron coatings, streaks, and segregations. The material is calcareous at a depth of about 70 inches. A few pebbles, consisting principally of quartzite, vein quartz, and granitic gneiss occur throughout the soil mass. Spots, a fraction of an acre in extent, in which heavy impervious silty clay occurs at a depth ranging from 10 to 20 inches, are common. On narrow divides and steeper slopes, erosion has exposed the yellowish-brown heavy silt loam or silty clay loam subsoil.

This soil warms comparatively early and, because of its mellowness, can be worked into a good seedbed. About 90 percent of it is tilled. Corn, the principal crop, is grown on an acreage 15 percent greater than that of the small grains (wheat and rye). Hay is the third crop in importance. About 2 percent of the land is devoted to tobacco which is grown mainly on sloping land having a good supply of available mineral elements. Some small orchards of apples, peaches, and pears, when properly sprayed, pruned, and cared for, produce well, as the texture of this soil favors root penetration, and its location on ridges is particularly well suited for air drainage. Corn yields average about 29 bushels an acre, wheat 11 bushels, rye 12 bushels, tobacco 950 pounds, and hay 1 ton.

General farming is the principal type of agriculture practiced on this soil. Almost all the hay and grain is fed to the farm livestock. Wheat, rye, and tobacco are cash crops. Some farmers make a practice of buying a carload of steers each year for fattening, and many have small flocks of sheep and a few hogs.

A common crop rotation consists of corn, followed by wheat or rye, and these by hay consisting, generally, of mixed clover and timothy. An acre application of 100 pounds of a 2–12–2 or 2–12–6 commercial fertilizer is applied in the row for corn, and 150 pounds for wheat or rye. For tobacco, 500 pounds of a 3–8–6 mixture, supplemented with a heavy application of stable manure, is used.

GRAYISH-BROWN SOILS OF THE UPLANDS

The group of grayish-brown soils of the uplands includes the members of the Maddox, Bentonville, Ellsberry, and Jacksonville series, and Eden silt loam, which have level or gently rolling relief; and soils of the Fairmount, Heitt, and Otway series, and Eden silty clay loam, derived from limestone, dolomitic limestone, and calcareous shale materials, which occupy steep slopes, have well-drained surface soils and upper subsoil layers, but have restricted drainage in the lower part of the subsoil and parent material. Also included are Rossmoyne silt loam, Loudon silt loam, and Jessup silt loam, which are grayish-brown soils originating from glacial till. They have level or gently rolling relief, and have well-drained surface soils, but drainage is somewhat restricted in the lower part of the subsoils. Edenton silt loam is developed from similar material but occupies steeper slopes. The grayish-brown soils of the Appalachian Plateaus section, developed from noncalcareous shale on the rolling lands and steeper slopes, are classed in the Colyer, Naceville, Latham,

Rarden, and Muskingum series; and the soils of the same section, which occupy the nearly level land and gentle slopes, are Tilsit silt loam and Fawcett silt loam.

The Ellsberry soils are unlike the other soils of this group, in that they contain pronounced red and yellow specks and numerous black manganese and iron specks, stains, coatings, and concretions in the lower part of the subsoil. Bentonville silt loam differs in having a lower surface gradient, a higher content of clay, and, consequently, poorer internal drainage.

Owing to their restricted drainage in the lower part of the subsoil, due to a higher content of impervious clays, those grayish-brown soils of the uplands, with level or gently rolling relief, return somewhat lower yields than the brown soils; but, because of their good topsoil and upper subsoil drainage, crop yields are far better than those obtained on the gray soils. Probably 80 percent of these soils is cultivated.

Where grayish-brown soils are on steep slopes, internal drainage is better. In the Interior Low Plateaus section, the neutral to alkaline subsoil or parent soil material, well supplied with available mineral elements, is exposed at the surface. In such situations these soils are comparable to the brown soils in productiveness and are used extensively for tobacco and corn. Probably one-half of the tobacco grown is produced on such soils. In the Appalachian Plateaus section, soils occurring on steep slopes are very acid, low in organic matter, and low in available mineral plant nutrients, and they remain almost entirely in forest.

Maddox silt loam.—West of the Hagerstown silt loam areas, in the vicinity of Bentonville, extending to the Brown County line, are areas of Maddox silt loam. These areas occur as narrow fingerlike ridges and gentle slopes, and they are closely associated with Eden silt loam and Heitt silt loam, which cover adjacent valley slopes, and with Ellsberry silt loam on nearby ridges.

The surface soil consists of light grayish-brown slightly acid mellow silt loam grading, at a depth of about 8 inches, into yellowish-brown friable heavy silt loam, which changes in texture, at a depth of about 12 inches, to silty clay loam that continues to a depth of about 24 inches. This material rests on mottled grayish-brown and yellowish-brown silty clay which, with increasing depth, grades into olive-yellow calcareous plastic clay. At a depth ranging from 40 to 70 inches the material is underlain by interstratified beds of shale and limestone (Richmond formation).

Two small areas, representing an eroded phase of this soil, are included in mapping, one of which occurs in the extreme southwestern corner of the county on a very narrow ridge where erosion has removed practically all of the surface soil. The soil material consists of yellowish-brown silty clay loam within a few inches of the surface. The other area, which also is on a very narrow ridge, lies a few miles southwest of Manchester, and all the surface soil has been washed off. Here the material consists of grayish-brown silty clay loam overlying gray and purple silty clay shale material.

About 85 percent of Maddox silt loam is cultivated. Corn, wheat, mixed timothy and clover hay, rye, and tobacco, ranking in acreage in the order named, are the main crops. The same farm practices

prevail as on Bratton silt loam, but yields are somewhat lower, owing to the heavy texture throughout the subsoil and parent material, which, to some degree, restricts internal drainage.

Ellsberry silt loam.—Lying west of the Hagerstown silt loam areas in the southwestern part of the county, and closely associated with Maddox silt loam, are areas of Ellsberry silt loam, which occupy a few narrow interstratified limestone and shale ridges (Richmond formation). The relief ranges from level to gently sloping.

This soil is light-brown or light reddish-yellow friable silt loam to a depth of about 8 inches, but it differs from other soils of this group in that the surface layer grades into reddish-yellow silty clay loam which, with increasing depth, is very much speckled with red and yellow and contains numerous coatings, streaks, and concretions of manganese and iron material. At a depth ranging from 24 to 30 inches, the texture is heavier and gray mottlings occur. At a depth of about 36 inches, the material is heavy reddish-yellow silty clay containing gray mottlings.

Approximately 80 percent of this soil is cultivated, and the rest is used for wood lots, permanent pasture, and buildings. The crops grown and farm practices are similar to those on Bratton silt loam, but, owing to the imperfect internal drainage consequent to the heavy subsoil, crop production is somewhat lower.

Ellsberry silty clay loam.—Closely associated with Maddox silt loam and Ellsberry silt loam, and occurring in similar positions on narrow ridges of interstratified shale and limestone, is Ellsberry silty clay loam. This soil includes many limestone sinks, ranging from 10 to 300 feet in diameter and from 5 to 30 feet in depth. Surface waters, which erode many of these areas, drain into the sinks.

Ellsberry silty clay loam differs from Ellsberry silt loam and Maddox silt loam in that a part or all of the surface soil has been eroded, and the texture is heavier throughout. This soil consists of brown silty clay loam grading, at a depth of about 10 inches, into light reddish-yellow silty clay which, below a depth of 20 inches, is highly speckled with red and yellow and contains numerous coatings, streaks, and concretions of manganese and iron material.

This is an inextensive soil. Owing to its more restricted internal drainage, its productivity is lower than that of Ellsberry silt loam.

Bentonville silt loam.—Bentonville silt loam is developed on low broad undulating ridges in the vicinities of Bentonville, West Union, and Unity, and north of Tranquility. It is a fairly extensive soil.

The surface soil, to a depth of 8 inches, is grayish-brown, grayish-yellow, or yellowish-brown friable silt loam. This material is underlain by grayish-yellow heavy silt loam or silty clay loam, which becomes yellow at a depth of 20 inches, and it grades into brownish-yellow silty clay at a depth of about 27 inches. This material rests, at a depth of about 50 inches, on light brownish-red calcareous shales interstratified with limestone.

Included with this soil, as mapped, are a few bodies, aggregating one-half square mile, which occupy flats and very gently sloping areas in the vicinities of West Union and Bentonville. Such areas represent grayer less well-drained soil which, to a depth of 8 inches, consists of grayish-brown or cream-colored friable acid silt loam.

To a depth of 40 inches, this material is underlain by mottled gray, olive-gray, yellow, and brown plastic silty clay which rests on grayish-yellow plastic silty clay that is calcareous at a depth of about 45 inches. This material, at a depth of about 51 inches, grades into the calcareous mottled gray and yellow Crab Orchard shales. Approximately 25 percent of this included soil is cultivated, and the rest is in wood lots and permanent pasture. Owing to the very poorly drained acid condition and comparatively low supply of available mineral elements, crop yields are decidedly below the average.

About 80 percent of Bentonville silt loam is cultivated. The acreage ratios for various crops and the farm practices employed are essentially like those for Bratton silt loam, but yields, owing to the impervious underlying layers which restrict internal drainage, are lower.

Bentonville silt loam, slope phase.—The slope phase of Bentonville silt loam occurs in small areas west of West Union, north and south of Unity, and between Tranquility and the northern county line. This soil differs from typical Bentonville silt loam in having a gently sloping or sloping relief, with such a thin surface soil that, over small areas, the grayish-yellow silty clay loam subsoil is exposed when the land is cultivated. Some of the steeper slopes along intermittent streams are more or less gullied.

The larger areas of this soil are between Tranquility and the northern county line, and they cover highly eroded, comparatively steep slopes of small perennial stream or intermittent stream valleys. The surface soil is thin, and in some places the grayish-yellow silty clay loam subsoil or parent materials are at the surface. Such areas are within the glaciated region, and small glacial rocks, including quartzite, granite gneiss, and vein quartz, are scattered over the surface and are embedded in the surface soil and upper part of the subsoil; but the lower part of the subsoil and underlying material have developed from the weathered products of Crab Orchard shales in place. These soil materials in many places have, to some degree, been moved down the slope by slumping. Because of its erosibility, this soil is not adapted to cultivated crops, and the land is used for permanent pasture.

Jacksonville silt loam.—Jacksonville silt loam occurs as flat, gently undulating, or gently sloping bodies within larger areas of Bratton silt loam, between Fawcett and the northern county line, the largest areas occurring in the vicinity of Peebles.

The cultivated soil, to a depth of 8 inches, consists of friable grayish-brown, pale yellowish-gray, or light reddish-yellow silt loam. This is underlain by vesicular grayish-yellow heavy silt loam which, at a depth of about 14 inches, grades into a 16-inch layer of grayish-yellow silty clay loam containing gray mottlings. This material, in turn, is underlain by mottled yellow and gray plastic silty clay which, at a depth of about 70 inches, rests on gray shale.

Included with this soil as mapped, because of their small extent, at the heads of gullies and in other depressions, are very small poorly drained areas, in which the surface soil is yellowish brown and contains more organic matter than the typical soil. Areas of a better drained variation occur 2½ miles east of Peebles and 1 mile northeast

of Locust Grove, where internal drainage is better than normal, as evidenced by the fact that the brownish-yellow subsoil extends to a depth ranging from 22 to 36 inches, where faint mottlings of gray and yellow occur. At a depth of about 33 inches is a 2- or 3-inch bed of shale which overlies a dolomitic limestone formation.

About 80 percent of this land is cultivated, and the uncultivated part is used for permanent and wood-lot pastures. About the same crops .are grown as on Bratton silt loam, but yields are somewhat lower because of poor internal drainage.

Eden silt loam.—Either adjoining bodies of Hagerstown silt loam on lower ridge slopes or covering ridges of the Richmond formation farther west near the Brown County line, in the southwestern corner of Adams County, are a few small areas of Eden silt loam. This soil occupies moderately steep slopes.

To a depth of 8 inches, the surface soil is friable grayish-brown neutral silt loam. This is underlain by heavy brown or yellowish-brown silt loam which has a silty clay loam texture below a depth of 14 inches and, at a depth ranging from 18 to 32 inches, contains manganese and iron concretions, coatings, and streaks. Below this is olive-yellow or olive-brown calcareous silty clay.

About 75 percent of the land is cultivated. Its favorable texture and relief, good drainage, and neutral reaction render it well adapted to corn, tobacco, and legumes, and crop yields are about the same as on Eden silty clay loam. On the steeper slopes the soil is susceptible to erosion, and in many fields it is necessary to maintain permanent bluegrass pastures.

Fairmount silty clay loam.—Fairmount silty clay loam is developed on 15 to 35 percent valley slopes, from interbedded shale and limestone material, with irregular fossiliferous limestone fragments closely strewn over the surface and embedded in the soil. The soil material is neutral or alkaline in reaction at the surface. Most bodies of this soil adjoin areas of Heitt silty clay loam, on the upper slopes, and soils of the terraces or flood plains at the bases of the slopes.

The 3- or 4-inch surface layer is dark grayish-brown neutral or slightly calcareous friable silty clay loam. It is underlain by brownish-gray calcareous silty clay which, at a depth of about 11 inches, merges with olive-yellow or olive-gray plastic silty clay material derived from disintegrated beds of shale and limestone of the Richmond formation. Between Harshasville and Lawshe are small areas, included in mapping, in which glacial crystallines are in the surface soil, in the upper part of the subsoil, and scattered over the surface. In other respects the soil material is like that of typical Fairmount silty clay loam.

Probably 50 percent of this soil has been tilled, but it was abandoned because of its erosibility. After the second year of cultivation the surface soil was gone, and the following year erosion of the subsoil began, followed by the formation of gullies which range from 1 to 7 feet in depth. At present probably 5 percent of the land is cultivated, and the rest is in bluegrass pasture, over which is scattered a second growth of locust, oaks, and heath. Because of its heavy, plastic character, this soil can be cultivated only when the content of moisture is right for pulverization, as it tends to puddle if worked

when wet and on drying becomes very hard and cracks, breaking into large lumps when plowed. The comparatively high content of organic matter in the surface soil, in addition to retaining moisture, thus providing against drought, absorbs the sun's heat and tends to maintain a uniform temperature, prevents the soil running together, improves the tilth, and, because of its active decomposition, supplies nitrogen and renders available other mineral plant nutrients. These characteristics, in addition to its good drainage, its tendency to break into small granules, and its neutral to alkaline reaction, make this one of the most fertile soils of the county. It returns among the highest acre yields of tobacco, corn, and alfalfa. Tobacco yields average about 1,000 pounds an acre, corn 40 bushels, and alfalfa 2 tons.

The usual method of cultivating this soil is to clear and break the bluegrass sod; plant the land to tobacco or corn for 1 year, during which time the grass and locust roots hold the soil in place and prevent erosion; after which the field is seeded to rye and bluegrass and left in sod for 4 or 5 years. Under this method, erosion does little damage. Commonly very little fertilizer is used, except in starting tobacco plants.

Fairmount silty clay loam, colluvial phase.—Small areas of colluvial material washed from Fairmount silty clay loam slopes occur in many places, and these have been mapped as a colluvial phase of this soil. The surface soil in such areas differs from the typical soil in having, in some places, a very dark gray surface soil and in other places a gray surface soil. Such areas are similar in use, value, and crop adaptations to typical Fairmount silty clay loam, but yields average slightly higher.

Eden silty clay loam.—Eden silty clay loam resembles Fairmount silty clay loam in that it has limestone fragments strewn over the surface and embedded in the soil, in the high content of organic matter in the surface soil, good drainage, and a brownish-gray silty clay layer extending from about 4 to 11 inches below the surface. It differs from the Fairmount soil in having an olive-brown, yellowish-brown, and olive-yellow subsoil.

Included with the Eden soil as mapped are several small areas associated with soils derived from glacial materials. Some of these are near Seaman, and about 1 square mile of such soil is in the vicinity of Olive School south of Unity. In these areas, on less steep valley slopes than typical, the surface soil has almost disappeared because of erosion, and the land is so badly gullied that cultivation is impossible. Glacial erratics, such as quartzite, vein quartz, and granite gneiss, are scattered over the surface, and some are embedded in the soil material.

Most of Eden silty clay loam occurs in the southwestern quarter of the county, particularly in the sections southwest and northwest of Manchester. In the percentage of land cultivated, content of organic matter, crops grown, adaptations, fertilization, producing power, and yields, this soil is similar to Fairmount silty clay loam.

Heitt silty clay loam.—Heitt silty clay loam is developed on steep valley slopes. It occurs most extensively over interbedded limestone and calcareous shale (Richmond formation), with limestone predominating in the southwestern corner of the county; and in small areas over Brassfield limestone in the valleys of Ohio Brush Creek and its

larger tributaries. This soil differs from Fairmount silty clay loam and Eden silty clay loam in having a reddish-brown silty clay loam surface soil underlain, at a depth of about 8 inches, by reddish-brown heavy silty clay which, at a depth of about 33 inches, grades into olive-yellow silty clay like that of the Eden and Fairmount soils. Many limestone fragments are scattered over the surface and embedded in the soil. Numerous outcrops of the Brassfield limestone stand out as ledges.

On valley slopes immediately below areas of Hagerstown silt loam and outcrops of Brassfield limestone, small areas, aggregating about one-half square mile, are developed as narrow belts extending parallel with the edges of ridges where the shale is variegated purple and gray. In such areas this coloring is expressed in the subsoil which is mottled purple and gray below a depth ranging from 12 to 30 inches. South of Spencer Hill, some of the areas of Heitt silty clay loam are associated with soils derived from glacial materials, and they have quartzite, vein quartz, granite gneiss, and other glacial erratics scattered over the surface and embedded in the surface soil and upper part of the subsoil. Two small areas, 1 mile southwest of Harshasville, differ from those south of Spencer Hill in having a surface soil of silt loam texture. Other soils associated with those derived from glacial-till materials and included in mapping with Heitt silty clay loam occur on the valley slopes in the northwestern quarter of the county, particularly in the valley of Ohio Brush Creek. These resemble Heitt silty clay loam, except that glacial erratics are on the surface and more or less disseminated throughout the surface soil and upper part of the subsoil.

The percentage of land under cultivation, agricultural practices, crops grown, and yields are essentially the same as those for Fairmount silty clay loam.

Heitt silt loam.—Heitt silt loam occupies valley slopes adjacent to ridges on which the Hagerstown and Ellsberry soils have developed. The silt loam differs from the silty clay loam in that it has less sloping relief; a deeper, lighter textured, and more friable surface soil; a more open and lighter textured upper subsoil layer; and in that it is much less eroded. It resembles the silty clay loam in color of the surface soil and in having reddish-brown silty clay in the lower part of the subsoil which is underlain by olive-yellow silty clay. On the valley slopes of Ohio Brush Creek and its tributaries about Seaman and Harshasville are small areas where the surface soil and upper part of the subsoil are modified by glacial material, as evidenced by the presence of erratics; but the lower part of the subsoil and parent material are comparable to Heitt silt loam.

Owing to more favorable relief and texture than that of Heitt silty clay loam, about one-half of this soil is cultivated. Corn, tobacco, wheat, and rye are grown, and yields rank among the best in the county.

Otway silty clay loam.—Occurring on steep valley slopes of Ohio Brush Creek and its many tributaries and along small streams in the vicinity of West Union, contiguous to the Heitt soils and the slope phase of Bentonville silt loam, on lower valley slopes, and the slope phase of Bratton silt loam, on upper valley slopes, are areas of Otway silty clay loam.

Where erosion has been least severe, the surface soil, to a depth of 6 inches, is light grayish-brown, light-gray, or grayish-yellow somewhat acid fine-lumpy silty clay loam. This is underlain by neutral mottled gray, yellowish-brown, and brownish-yellow lumpy silty clay which is calcareous at a depth ranging from 15 to 30 inches. In many places the surface soil is entirely lacking, and the silty clay subsoil is exposed at the surface. Where associated with soils developed from glacial drift, such as Rossmoyne silt loam, some glacial crystalline material is on the surface and in the upper part of the soil profile.

About 8 percent of this land is tilled, and the rest is largely in woodland pasture. The cultivated soil is used mainly for corn.

Otway silty clay loam, smooth phase.—Otway silty clay loam, smooth phase, is inextensive. It occurs principally between West Union and Harshasville at the bases of steep slopes, where colluvial materials from Otway silty clay loam areas have accumulated. It also occurs on some comparatively low narrow ridges and gentle valley slopes within larger areas of Otway silty clay loam. This soil differs from Otway silty clay loam in having gently sloping relief which is favorable for all the farm crops commonly grown. A few small areas in the glaciated section of the north-central part of the county are included with this soil as mapped, where crystalline glacial rocks are scattered over the surface and are embedded in the surface soil and upper part of the subsoil, but in other respects the soil corresponds to soil of this phase.

Otway silty clay loam, gullied phase.—Otway silty clay loam, gullied phase, has the same general distribution as typical Otway silty clay loam. It occurs on the steeper and much gullied slopes, where the surface soil and, in many places, the subsoil have been washed away, and the heavy gray or olive-gray neutral or calcareous silty clay is at the surface. This soil is used largely for woodland pasture. Some of the larger trees are cut for cross ties, telephone poles, and fuel.

Otway silt loam.—The main occurrence of Otway silt loam is south of West Union on the steep valley slopes of Donaldson Run and Beasley Fork, between areas of Bentonville silt loam and Heitt silt loam on the lower slopes and between Bentonville silt loam and the slope phase of Bratton silt loam on the upper slopes.

Owing to its more favorable texture, better internal drainage, less sloping relief, and less erosion, this soil is better suited for producing crops than is Otway silty clay loam.

The surface soil, to a depth of 6 inches, is smooth mellow light grayish-brown acid silt loam. It is underlain by yellowish-brown or grayish-brown acid silt loam which, at a depth of about 16 inches, grades into mottled gray, yellowish-gray, and yellowish-brown silty clay loam. This, at a depth of about 24 inches, rests on olive-gray heavy calcareous silty clay material consisting, for the most part, of disintegrated shale. Within areas of this soil are numerous spots from which erosion has removed the surface soil, and in places the subsoil also, thereby exposing the disintegrated shale. In such places, more or less gullying is common.

About 12 percent of this land is under cultivation, and the rest provides woodland pasture and in addition supplies some logs, cross ties,

telephone poles, and cordwood. It is used for the same crops as Otway silty clay loam.

Rossmoyne silt loam.—Rossmoyne silt loam occurs only in the northwestern corner of the county. Where associated with Cincinnati silt loam it occupies intervalley areas, but in association with Avonburg silt loam and Clermont silt loam it is adjacent to or on the valley slopes. The relief ranges from undulating to gently rolling.

Rossmoyne silt loam is unlike Cincinnati silt loam in that it has poorer internal drainage, which has resulted from its less sloping relief, together with impervious layers occurring nearer the surface. This poorer drainage is indicated by a lighter shade of brown in the friable silt loam surface soil which is underlain at a depth of about 8 inches by light yellowish-brown silt loam, and this, in turn, at a depth of about 16 inches, grades into yellowish-brown silty clay loam containing gray and yellow mottlings. Mottling becomes more pronounced with depth, and, at a depth of about 35 inches, olive-brown silty clay is present.

Probably 90 percent of this land is tilled. The uncultivated areas, which are chiefly on the steeper slopes, are used for wood lots and permanent pastures. The same crops are grown on this soil as on Cincinnati silt loam, but a smaller proportion of the land is devoted to tobacco and rye and a larger proportion to wheat. Eroded areas, where the reaction of the soil is neutral, are selected for tobacco. In normal and dry years crop yields are essentially the same as on Cincinnati silt loam, but in wet years, owing to imperfect internal drainage, yields are somewhat lower.

Loudon silt loam.—Occurring mainly east of the areas of Rossmoyne silt loam and Cincinnati silt loam in the northwestern quarter of the county, are rather extensive areas of Loudon silt loam, which have an aggregate area of 30.5 square miles. This soil resembles Rossmoyne silt loam in relief and drainage, as well as in the color, texture, and consistence of the surface soil and upper subsoil layers, but differs in that soil material free of glacial erratics and consisting of mottled brown, yellow, and gray calcareous silty clay loam or silty clay, derived from disintegrated material from beds of interstratified limestone and shale, occurs at a depth ranging from 40 to 50 inches. Owing to less leaching, lime and more of the available mineral elements are within reach of deep-rooted plants than in either the Rossmoyne or Cincinnati soils.

Between Winchester and Seaman, in close association with Cincinnati silt loam, but on less sloping parts of ridges, are bodies included with Loudon silt loam, which cover a total area of about 1 square mile. The soil in these areas differs from the Cincinnati soil in having a more yellow color in the surface soil and a heavier plastic layer in the subsoil; the soil also differs from typical Loudon silt loam in that the depth to calcareous material ranges from 80 to 100 inches below the surface.

About 90 percent of Loudon silt loam is cultivated. The same crops are grown on it as on Cincinnati silt loam and Rossmoyne silt loam, but, owing to a higher degree of natural fertility, average yields are somewhat higher with essentially the same fertilizer applications. Tobacco, clover, and bluegrass are grown more extensively. The

areas in which calcareous materials are at slighter depths are especially favorable for these crops.

Loudon silt loam, slope phase.—Loudon silt loam, slope phase, occurs in the northern part of the county, between Lawshe and the northern county line, on steep severely gullied valley slopes of Flat Run and other tributaries of Ohio Brush Creek. It is distinguished from typical Loudon silt loam by its thin light-brown surface soil which is, in some places, entirely absent, leaving the yellowish-brown subsoil exposed. These slopes are not cultivated, but, because of the nearness of the calcareous material to the surface, together with numerous exposures, from which the colluvial wash has mixed more or less with the surface materials at lower levels, much of the surface soil is neutral or very slightly acid. This condition favors the growth of bluegrass and sweetclover, which form a protective cover for the slopes.

Jessup silt loam.—Jessup silt loam occurs in the west-central part of the county. The principal bodies of this soil border areas of the Rossmoyne and Loudon soils on the north and the Heitt and Hagerstown soils on the south. In its occurrence in narrow fingerlike ridges and on gentle slopes it resembles the latter two soils, but like the Rossmoyne and Loudon soils it lies within the glaciated section. The 8-inch surface soil consists of grayish-brown or light-brown friable silt loam. It grades into a yellowish-brown silty clay loam subsoil which rests, at a depth ranging from 24 to 40 inches, on yellowish-brown silty clay containing olive-colored mottlings. Some glacial erratics, including quartzite, vein quartz, and granite gneiss, occur in greater or less abundance on the surface and embedded in the surface soil and upper part of the subsoil. The lower part of the subsoil is derived from the underlying interstratified limestone and shale.

About 85 percent of the land is cultivated. The crops grown, yields, fertilization, and methods of cultivation employed are similar to those on Bratton silt loam.

Edenton silt loam.—The brownish-gray soil of the second group occupying steep valley slopes is classed as Edenton silt loam. This soil has a total extent of 32 square miles. It occurs in the northwestern quarter of the county, where it occupies the upper valley slopes of many creeks and the entire area of many intermittent stream valleys. In most places bodies of this soil border Cincinnati silt loam or Rossmoyne silt loam on the ridge tops and Fairmount silty clay loam on the lower slopes of the larger valleys. It represents a variety of soil conditions, resulting from erosion, slumping, and colluvial wash. On the more gentle slopes it resembles Cincinnati silt loam in color and texture, but the surface soil is thin, and the surface material is neutral or slightly acid and is well supplied with available mineral elements. Calcareous material lies within a depth ranging from 35 to 45 inches. On the steeper slopes the soil consists of yellowish-brown heavy neutral silt loam or silty clay loam, grading into yellowish-brown calcareous silty clay at a depth ranging from 24 to 30 inches.

North of Cherry Fork and west of Buck Run interstratified beds of limestone and shale occur in most places at a depth ranging from 4 to 6 feet, whereas south of Cherry Fork and east of Buck Run the limestone and shale beds are generally between 2 and 4 feet from the surface, and they outcrop at many places. More or less limestone

fragments are scattered over the surface, but they are particularly numerous in places where the formation is near the surface. On and adjacent to the floors of small intermittent stream valleys are accumlations of colluvial material from sheet erosion and slumping on the slopes. The soil in such places has a neutral or alkaline reaction.

Fully one-half of this soil has been cleared and farmed, but, owing to its erosibility, it is now devoted mainly to permanent pasture and wood lots. At present only about 10 percent of it is cultivated. Owing to its excellent supply of available mineral elements and neutral or alkaline reaction, it is much better suited for tobacco, legumes, and bluegrass than are the adjacent Cincinnati and Rossmoyne soils.

Colyer silt loam.—On valley slopes of 15 to 35 percent gradient, throughout the part of the Appalachian Plateaus section lying north of South Fork Scioto Brush Creek, are extensive areas of Colyer silt loam. This soil has a very thin organic layer, consisting chiefly of forest litter over yellowish-brown silty clay loam or silty clay material which carries many shale particles, and which extends to a depth ranging from 8 to 15 inches. Wherever sandstone caps the adjacent ridges, fragments of sandstone have been strewn over the surface and have become embedded in the soil. In places where this soil is associated with Fawcett silt loam the soil material is derived from the heavy gray shale that underlies the Fawcett soils, and it is much heavier throughout the entire soil mass.

Probably 25 percent of the land has been cleared, but, because of its erosibility, it is now used for pasture. The remainder supports a forest growth in which scarlet oak predominates, and the undergrowth is blueberry and huckleberry.

Colyer silt loam, deep phase.—Associated with Fawcett silt loam in the vicinity of Conaway School are a few small gently rolling areas of a deep phase of Colyer silt loam.

The surface soil, to a depth of 6 inches, is friable grayish-brown silt loam. It is underlain by heavy yellowish-brown silt loam which, at a depth of about 16 inches, grades into silty clay loam and at a depth of 24 inches shows slight mottling of gray. Below a depth of 30 inches, the soil material contains numerous black shale particles which become more abundant with depth, and the material grades into beds of black shale at a depth of about 40 inches.

About 40 percent of this deeper soil is cultivated, and the rest supports a tree growth dominantly of scarlet, white, and chestnut oaks. Corn, wheat, and mixed timothy and clover are the important crops. Corn yields average about 20 bushels an acre, wheat 16 bushels, and hay 1 ton.

Colyer silt loam, steep phase.—Colyer silt loam, steep phase, is extensively developed throughout the Appalachian Plateaus section on very steep valley slopes, most of which have a gradient of more than 35 percent. It covers a total area of 36.4 square miles. This soil differs from the typical soil in having steeper slopes, a very thin or no organic layer, and many shale outcrops and shale fragments on the surface and embedded in the soil. These fragments become more numerous with depth, and the underlying shale beds occur at a depth ranging from 1 to 3 feet. Where the shales are gray, as along Scioto

Brush Creek Valley and on the lower valley slopes of most of the Appalachian Plateaus section, the soil material is heavy in texture, like that of Fawcett silt loam; but where black bituminous shale comprises the underlying formation, the soil material is much more friable, like that of Colyer silt loam. Where sandstone caps the adjacent ridges, irregular-shaped fragments of sandstone are more or less numerous over the surface of this soil and are also embedded in the soil. They are especially abundant in the higher lying areas near the sandstone outcrops.

No attempt is made to farm this soil, but it supports a forest growth in which scarlet oak is the principal tree, and chestnut, white, and post oaks are abundant.

Naceville silt loam.—Naceville silt loam, which is gently rolling, occurs on rock-cut terraces along Scioto Brush Creek, South Fork Scioto Brush Creek, and Turkey Creek, and on flats near the bases of steep shale slopes. The soil material has been accumulated by wash from sandstone ridges and shale slopes.

This soil, to a depth of about 8 inches, is slightly acid grayish-yellow or light grayish-brown silt loam. It is underlain by brownish-yellow heavy friable silt loam which, at a depth of about 28 inches, changes to gravelly silty clay loam. The substratum of gray shale occurs at a depth of 80 inches. Throughout the soil mass are small rounded gravel, a few cobbles, and some irregular-shaped fragments of sandstone.

About 80 percent of the land is cultivated. Corn, small grains, mixed clover and timothy hay, and tobacco are the important crops. Corn yields average about 20 bushels an acre, wheat 15 bushels, and tobacco 800 pounds.

Naceville silt loam, slope phase.—Naceville silt loam, slope phase, is very inextensive. It occurs on slopes within areas of Naceville silt loam. It differs from the typical soil in that it occupies steep slopes and is more subject to erosion when cultivated.

Latham silty clay loam.—Latham silty clay loam occurs in a few small areas in the Appalachian Plateaus section in the extreme northeastern corner of the county, where it occupies long moderately steep slopes.

This soil is closely associated with Muskingum silt loam and its deep phase, but it differs from those soils and also from Fawcett silt loam in that it has a light grayish-brown friable acid silt loam surface soil which grades, at a depth of about 8 inches, into light reddish-brown heavy silt loam that, under pressure, breaks into small blocks and becomes heavier with increasing depth. This material, at a depth of about 29 inches, is underlain by reddish-brown clay containing gray mottlings, and this, in turn, rests on a clay-shale formation ranging in color from red to greenish gray.

Owing to its unfavorable relief, Latham silty clay loam is not cultivated. The land is in forest, principally of scarlet, white, and chestnut oaks.

Latham silty clay loam, steep phase.—The steep phase of Latham silty clay loam is closely associated with the typical soil. It is more extensive and occupies steep valley slopes. It differs from the typical soil in having less organic matter in the surface soil and many gullied and eroded spots where the clay shale is at the surface. The

land is entirely covered with oak forest, including scarlet, white, and chestnut oaks.

Rarden silt loam.—Rarden silt loam is closely associated with the steep and very steep phases of Muskingum silt loam in the extreme eastern part of the county. It occurs on long narrow ridge tops where the relief ranges from gently rolling to rolling. This is an inextensive soil. In some places the surface slope exceeds 15 percent, but, owing to the very small extent of such areas, they are not separated in mapping.

This soil resembles Muskingum silt loam, both in the character of its surface soil and in relief, but it differs from the Muskingum soil and Latham silty clay loam in having a light reddish-yellow heavy granular friable silt loam subsoil which is more red at a depth of about 19 inches and grades into mottled brownish-red, reddish-brown, and gray blocky silty clay loam at a depth of about 22 inches. This material continues to a depth of 28 or 30 inches, where it rests on mottled red, yellow, gray, and brown heavy silty clay which is a part of the bedrock consisting of an interstratified shale and sandstone formation.

About the same proportion of this land is under cultivation, and the same farm practices are employed as on Muskingum silt loam, deep phase; but crop yields, owing to a heavier subsoil which retains more moisture, are a little higher.

Tilsit silt loam.—Tilsit silt loam occurs only in the Appalachian Plateaus section in the northeastern part of the county, between Turkey Creek and the Pike County line. It occupies flat or gently sloping ridge tops and in most places is encompassed or largely flanked by the deep phase of Muskingum silt loam. Both surface and internal drainage are inadequate.

The surface soil of Tilsit silt loam, to a depth of 8 inches, consists of light grayish-brown friable silt loam. This is underlain by pale-yellow or grayish-yellow pervious silt loam which, at a depth of about 11 inches, grades into yellow silty clay loam. With increasing depth this material becomes heavier and shows mottlings of gray and brown. It rests, at a depth of about 30 inches, on compact yellow silty clay mottled with gray.

Almost all of this land has been cleared, but only about 50 percent of it is cultivated. About 40 percent is devoted to permanent pasture. It supports a growth of broomsedge, junegrass, smilax vines, and blackberry bushes, in addition to a young growth of sassafras, post oak, swamp white oak, pin oak, and scrub pine (*Pinus virginiana*). Corn, wheat, and timothy are the principal crops. Yields of corn average about 20 bushels an acre, wheat 13 bushels, and timothy three-quarters of a ton. About 150 pounds of superphosphate an acre are applied to land for wheat and corn. Because of poor drainage, this soil is not so well suited for orchards as are the better drained soils on the ridge tops.

Fawcett silt loam.—Fawcett silt loam occurs on gently sloping areas at the bases of slopes along the extreme western border of the Appalachian Plateaus section in a belt which crosses the county from north to south, beginning near the junction of Ohio Brush Creek and Ohio River and extending to the Pike County line north of Locust Grove.

This soil differs from Tilsit silt loam in that it is derived from gray shale material which overlies a dolomitic limestone formation. To a depth of 8 inches, it consists of grayish-brown heavy silt loam which is underlain by brownish-yellow plastic silty clay loam, and this, at a depth of about 20 inches, rests on mottled red, gray, and yellow plastic silty clay. At a depth ranging from 27 to 37 inches, the material is principally disintegrated shale, and at a depth of about 50 inches, beds of gray shale are present.

As mapped this soil includes a few small areas, aggregating about one-half square mile, of better drained soil occurring on narrow ridges near the confluence of Ohio Brush Creek and Ohio River. This included soil is used for the production of the same crops as is typical Fawcett silt loam, but better drainage of both the surface and upper subsoil layers causes it to be somewhat more productive. Another included area consists of a heavy soil covering about 80 acres 2 miles south of Scrub Ridge and just north of Cedar School where the land is flat, poorly drained, and entirely surrounded by typical Fawcett silt loam. The soil in this area, to a depth of 8 inches, is gray silt loam underlain by mottled gray, brownish-yellow, and dull-brown silty clay loam that, in turn, grades into silty clay at a depth of about 20 inches.

About 80 percent of Fawcett silt loam has been cultivated, and the rest is largely covered with scarlet, white, and chestnut oaks. Many fields have been abandoned on account of sheet erosion, and they are more or less covered with broomsedge, poverty grass, blackberry briers, sassafras, smilax vines, and post oak. Corn, wheat, and mixed timothy and clover hay are the important crops. Corn yields average about 18 bushels an acre, wheat 15 bushels, and hay 1 ton. A small acreage is planted to tobacco.

Muskingum silt loam.—Muskingum silt loam with its phases includes the well-drained shallow soils of the uplands in the eastern part of the county, associated with Waverly sandstone and shale. These soils cover 90 percent of the Appalachian Plateaus section of the county. In the northeastern part of the county they occur only on the higher knobs and ridge crests. They dominate the uneven ridge tops and extend down the sides below the contact of the Waverly sandstone and Ohio shale. South of the village of Blue Creek and east of Puntenneyville, with the exception of very small areas along streams and on ridge tops, they cover the entire section.

Ninety-five percent of the Muskingum soils is covered with forest. The land in the Shawnee State Forest is very largely the steep and very steep phases of Muskingum silt loam. On the ridges and upper slopes, chestnut, scarlet, black, white, and red oaks, and chestnut are the dominant trees, with red maple, sourwood, sour gum, and tuliptree (locally called tulip poplar) less common. At the heads of valleys and ravines the more important trees are tuliptree, basswood, white ash, shellbark hickory, red gum, beech, and sugar maple. On narrow ridges and in extremely droughty situations oaks of the blackjack, post, scarlet, and chestnut varieties are more numerous. Scrub, pitch, and shortleaf pines grow, particularly on southwestern slopes. Old clearings grow up to red maple, sumac, sourwood, yellow locust, tuliptree, red cedar, dogwood, sassafras, and sour gum. Grasses are soon displaced by brush and saplings.

Muskingum silt loam is not an extensive soil. It occupies the tops of long narow ridges throughout the extreme eastern part of the county. Its relief ranges from undulating to rolling.

The surface soil, to a depth of about 7 inches, is friable mellow grayish-brown or light brownish-yellow silt loam which grades into blocky yellowish-brown heavy friable silt loam. At a depth of about 18 inches the soil material contains many sandstone fragments which, with increase in depth, are more numerous and, at a depth ranging from 24 to 36 inches, the sandstone formation is present. Sandstone fragments, ranging from 1 to 6 inches in diameter, are scattered over the surface and are embedded throughout the soil mass. In places the fragments interfere seriously with cultivation.

About 90 percent of this soil has been cleared and cultivated, but, owing to sheet erosion, together with inaccessibility from the farm homes, many of which are in adjacent valleys, only about 25 percent is now under cultivation. Corn, wheat, and mixed clover and timothy hay are grown. Corn yields average about 18 bushels an acre, wheat 13 bushels, and hay three-quarters of a ton. So long as the content of organic matter is comparatively high, as on newly cleared land, yields are decidedly above the average and on such land a high grade of tobacco is produced. An acre application of 150 pounds of superphosphate is applied to wheatland and cornland. This soil is well suited to orchards, as the air drainage is excellent and the pervious, friable, well-aerated surface soils and subsoils are favorable for the penetration of roots.

Muskingum silt loam, deep phase.—The deep phase of Muskingum silt loam is unlike the typical soil in that it has gently undulating relief, a somewhat deeper surface soil with a slightly higher content of organic matter, the yellowish-brown silt loam subsoil extending to a depth ranging from 30 to 40 inches before bedrock is reached, and less sandstone fragments scattered over the surface and embedded in the surface soil and upper part of the subsoil.

This soil occupies comparatively broad ridges in the eastern part of the county. Its relief is suitable for the use of all kinds of farm machinery. It is the most productive Muskingum soil, and about 70 percent of the land is cultivated. The same kind of fertilizer is used and the same crops are grown as on the typical soil, but yields are better. Several commercial apple orchards are located on this soil, one of which, on Peach Mountain, contains several thousand bearing trees, mainly of the Rome Beauty variety.

Muskingum silt loam, steep phase.—The steep phase of Muskingum silt loam is much more extensive than the typical soil. It occurs in the Appalachian Plateaus section, in the extreme eastern part of the county, on a number of long narrow ridges and on valley slopes which range from 15- to 35-percent gradient. This soil is closely associated with typical Muskingum silt loam which occupies somewhat broader ridges, with the very steep phase which covers steeper slopes, and with the colluvial phase which represents accumulations along the bases of slopes. It also differs from typical Muskingum silt loam in its thinner organic layer, in the fact that bedrock lies within a depth ranging from 20 to 24 inches, in having more sandstone fragments scattered over the surface and embedded throughout the soil mass, and in the presence of outcrops of bedrock.

About 1 percent of this soil is used for the production of corn, wheat, and hay. A much larger proportion has been cleared and cultivated, but the land has been abandoned because of its erosibility. Owing to its steep relief, this soil is best adapted to permanent pasture or forestry.

Muskingum silt loam, very steep phase.—Muskingum silt loam, very steep phase, is the most extensive soil in Adams County, having an aggregate area of 65.1 square miles. It occurs only on the steeper valley slopes and very narrow ridges in the more broken sections of the Appalachian Plateaus section, extending over 90 percent of the upland in the southeastern corner of the county, 50 percent of that in the east-central part, and 25 percent of that in the northeastern corner. This soil is unlike the steep phase of Muskingum silt loam in that it occupies slopes of more than 35-percent gradient; includes numerous outcrops of sandstone, some of which are rocky cliffs or massive ledges; has a thinner organic layer; is underlain by bedrock at a depth ranging from 15 to 20 inches; and has more sandstone fragments scattered over the surface and embedded in the soil.

This soil is nonarable. It is either covered with forest or has been burned over.

Muskingum silt loam, colluvial phase.—The colluvial phase of Muskingum silt loam borders areas of the steep and very steep phases in the extreme southeastern part of the county. It occurs as long narrow bands at the bases of slopes, where material washed from slopes, gullies, and small tributary valleys has accumulated. Although little of this soil is shown on the map, many very small areas are included with mapped areas of the steep and very steep phases of Muskingum silt loam. The relief ranges from gently sloping to sloping.

The 7-inch surface soil is brown friable silt loam with a rather high content of small sandstone fragments. It is underlain by a yellowish-brown or brownish-yellow pervious gravelly or stony silt loam subsoil. The relief, together with the open character of this soil, favors cultivation and protects it, to a considerable degree, from serious erosion.

Probably 50 percent of the land is farmed in conjunction with the bottom soils of the valleys and is used chiefly for the production of corn. This land, owing to its good drainage and its situation above freshets, is selected for building sites by the farmers in the valleys.

GRAY POORLY DRAINED SOILS OF THE UPLANDS

The gray poorly drained soils, with their high water tables, have been subject to alternate wetting and drying, which has not allowed a deep rooting system; consequently, the accumulation of organic matter is comparatively small, and the replenishment of mineral elements through plant roots is slight. Because of excess moisture and natural infertility, yields are much lower on these soils than on soils of the other groups. Where adequate artificial drainage has been provided and general farm crops are well fertilized, these soils return good yields; but tobacco tends toward a dark- or red-colored leaf of heavy weight.

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The members of the Avonburg and Clermont series are light-gray poorly drained soils developed from glacial till. Burgin silty clay loam is a dark-gray poorly drained soil associated with the Bratton soils.

Clermont silt loam.—The distinguishing characteristics of Clermont silt loam are its light-gray poorly drained surface soil, deeply leached subsoil, and flat relief. This is a very inextensive soil which occurs in small areas within larger areas of Avonburg silt loam northwest of West Union. It differs from the Avonburg soil in the light-gray color of its surface soil, poorer drainage, and high degree of mottling in the subsurface layers. Its highly mottled gray, yellow, and brown subsoil is plastic impervious silty clay at a depth ranging from 14 to 24 inches. The clay impedes the movement of ground water and causes a waterlogged condition for long periods. The subsoil in a few small areas, south and east of Chaparral School, grades downward into calcareous silty clay material free from glacial crystallines, at a depth of about 50 inches, and this material, in turn, rests on beds of interstratified shale and limestone at a depth of about 80 inches.

Occurring in depressions and swampy areas at heads of streams within areas of Clermont silt loam, are small bodies having dark-gray slightly acid silt loam surface layers which grade, at a depth of 6 inches, into dark olive-gray silt loam containing yellow mottlings. Such areas are Blanchester silt loam but, owing to their small extent, are included with Clermont silt loam. Only in its poor natural drainage does this soil resemble Clermont silt loam, but it is much superior to the Clermont soil in its high content of organic matter and available mineral elements.

When drained, Clermont silt loam ranks among the better soils for corn. It is cultivated in conjunction with Avonburg silt loam, but a lower proportion of it is tilled, and yields, owing to its poorer drainage and lower content of available mineral elements, are somewhat less.

Avonburg silt loam.—Avonburg silt loam is characteristically developed on the gently undulating comparatively broad ridges. It is well distributed over the northwestern quarter of the county. Almost all the areas of this soil are completely surrounded by larger bodies of Rossmoyne silt loam or Loudon silt loam. The soil differs from Rossmoyne silt loam in its poorer drainage throughout; its brownish-gray surface soil; its yellowish-gray or grayish-yellow, finely mottled with light gray, yellowish gray, and brown, subsurface soil; and its mottled gray, yellow, and brown upper subsoil layer; all of which have resulted because of the flatter relief.

An important variation, which aggregates about 1 square mile, is closely associated with Jessup silt loam or Loudon silt loam near the central part of the county. This soil is like Avonburg silt loam from the surface to a depth of perhaps 40 inches, where the soil material is olive-yellow, olive-brown, and gray silty clay or silty clay loam that is calcareous at a depth of about 48 inches. It grades into interstratified beds of shale and limestone at a depth ranging from 60 to 70 inches.

About 85 percent of Avonburg silt loam is under cultivation. Corn, mixed timothy and alsike, and wheat are the principal crops,

corn occupying the largest acreage. Mammoth and little white clover, redtop, and soybeans often take the place of mixed timothy and alsike. Average yields, owing largely to poor drainage and low natural fertility, are somewhat below those on Rossmoyne silt loam. Corn yields average about 25 bushels an acre, wheat 10 bushels, mixed timothy and alsike clover hay 0.8 ton, and soybeans 11 bushels of seed and 1½ tons of hay.

This soil is naturally of low productivity, but with good methods of cultivation some farmers have increased crop production. The following 3-year rotation is in common practice: (1) Corn, (2) wheat, and (3) alsike clover and timothy. On some farms soybeans have been introduced into the rotation, giving a succession of corn, soybeans, wheat, and mixed alsike clover and timothy. On some farms soybeans are grown with corn and used for hog pasture. The fertilizer most commonly used is a 2–12–2 mixture, which is commonly appied to both wheat and corn at a rate ranging from 100 to 175 pounds to the acre. Stable manure is applied to cornland.

Farmers who have tiled this soil report that laterals placed at intervals of 40 feet and at a depth ranging from 24 to 30 inches have proved very satisfactory. In fields where tile are not used, some farmers eliminate the dead furrow by throwing the furrow slices one way and then open furrows with the plow, in order to take care of the surface drainage.

Burgin silty clay loam.—Burgin silty clay loam occurs as small depressions and areas along drainageways within large bodies of Jacksonville silt loam and Bratton silt loam, in the vicinity of Peebles. Owing to the very poor drainage, a large quantity of organic matter is accumulated in the surface soil.

The surface soil, to a depth of 10 inches, is mellow dark-gray plastic silty clay loam having a neutral reaction. It grades into mottled yellow-brown, brown, gray, and dark-gray silty clay loam which changes to silty clay at a depth of about 15 inches. Below a depth of 21 inches are many manganese and iron coatings, streaks, and concretions. A small area 1½ miles north of Peebles, which is included with this soil in mapping, has a grayish-black or black surface soil of mucky silty clay loam to a depth of 14 inches.

About 90 percent of Burgin silty clay loam is cultivated. Owing to its large supply of organic matter, neutral reaction, and high content of available mineral elements, this is the best upland soil in the county for corn and clover. Yields of corn average 45 bushels an acre and of clover 1½ tons.

BROWN SOILS OF THE TERRACES AND BOTTOM LANDS

The soils of this group occupy about one-tenth of the area of the county, and rank among the most productive. Probably 85 percent of them is under cultivation.

Included with this group are the Wheeling soils on the terraces and the Huntington soils on the flood plains along Ohio River; the Williamsburg and Dunkinsville soils on the terraces, and the Huntington and Genesee soils on the flood plains of tributaries of Ohio River in the Interior Low Plateaus section; and the Pope soils on the flood plains of streams in the Appalachian Plateaus section.

The Wheeling and Huntington soils along Ohio River differ from the other soils of the group in their slick feel, which is caused by a high content of mica, and in that the soil materials have been transported from all eastward-lying parts of the Ohio River drainage basin. All the terrace soils are acid, but Dunkinsville silt loam, because of its longer period of development, is acid and leached of its carbonates to a depth ranging from 8 to 10 feet, whereas carbonates occur in the Wheeling and Williamsburg soils at a depth ranging from 7 to 8 feet. The Huntington and Genesee soils are neutral in reaction throughout, and free carbonates are present at a depth ranging from 5 to 6 feet, but the Pope soils are acid throughout. The unleached parent materials of all the soils are calcareous, except those of Pope silt loam, which are derived from noncalcareous shale and noncalcareous sandstone.

The principal trees growing on the brown well-drained soils of the terraces are sugar maple, white ash, basswood, black walnut, buckeye, butternut, and tuliptree. Some papaw, spicebush, witch-hazel, cedar, hemlock, beech, scarlet oak, blue ash, and red elm grow. In the flood plains comprising brown well-drained soils, sycamore, willow, and soft maple are dominant, and white oak, white elm, cedar, arborvitae, and hemlock grow in association with them.

The brown well-drained alluvial soils have been cleared and are very largely under cultivation. Fertilizer treatment of the soils on the terraces is similar to that on the upland. In general, no fertilizer is used on the soils of the flood plains.

Wheeling silt loam.—Wheeling silt loam is the most extensive soil of the terraces in the county. It occurs only on the higher terrace levels along Ohio River and is subject to inundation only at times of extreme floods. The relief is level or gently undulating.

The surface soil is brown or dark-brown friable mellow acid silt loam to a depth of 8 or 10 inches. This is underlain, to a depth of 17 inches, by friable yellowish-brown or brown acid silt loam which has a greasy or slick feel caused by fine particles of mica. Below a depth of 17 inches the material is more compact and consists of micaceous heavy silt loam which becomes lighter in texture below a depth of 24 inches and passes into a loam that contains much sand and gravel at a depth ranging from 50 to 60 inches. At a depth ranging from 8 to 10 feet are beds of stratified sand and gravel. Included with this soil, as mapped, are about 10 acres of Wheeling very fine sandy loam, on a low narrow ridge just north of Wrightsville.

Wheeling silt loam is fairly well supplied with organic matter, is retentive of moisture, warms early in the spring, and is comparatively easy to till. Probably 95 percent of the land is cultivated. Corn and tobacco are the chief crops. Average yields of corn are about 35 bushels an acre and of tobacco 800 pounds. The quality of tobacco grown on this soil is not so high as that grown on the Fairmount, Eden, and Heitt soils.

In the vicinity of Rockville, cantaloups of very good grade are produced, and in a number of places, early sweet corn is grown for the Portsmouth and Cincinnati markets. In growing cantaloups, an application of 300 pounds of 3-8-6 fertilizer to the acre is made in the row.

Wheeling silt loam, slope phase.—A slope phase of Wheeling silt loam occurs in long narrow bands on faces of terrace escarpments along Ohio River and tributary streams, where they have cut their channels into the Ohio River terraces. In most places the subsoil material is exposed at the surface. Most of the slopes are sodded with bluegrass or are covered with weeds, briers, and bushes.

Wheeling sandy loam.—Wheeling sandy loam areas occur on the terraces of Ohio River within larger areas of Wheeling silt loam, in the southeastern corner of the county. It is unlike Wheeling silt loam in that it has a dunelike relief and a brown loamy fine sand surface soil underlain, at a depth of about 8 inches, by yellowish-brown loamy fine sand which, at a depth of about 30 inches, grades into yellowish-brown or brown fine sandy loam. This material, at a depth of about 60 inches, rests on brown sandy loam streaked with grayish brown, which continues to a depth ranging from 8 to 9 feet, where beds of sand are present.

This soil is largely under cultivation and is used for the production of truck crops, corn, and wheat.

Huntington silt loam.—Huntington silt loam is brown, grayish-brown, or dark-brown friable mellow silt loam which changes very gradually, at a depth of 10 or 12 inches, into somewhat lighter colored material of slightly heavier texture, that continues to a depth of more than 4 feet. Throughout, the soil material is characterized by its neutral reaction and by the presence of fine flakes of mica, which gives it a greasy feel.

A variation of Huntington silt loam, covering an aggregate area of 1 square mile in the southwestern quarter of the county, occurs along tributary streams of Ohio River and is associated with soils derived from residual limestone and calcareous shale materials. It differs from the soil along Ohio River, in that it has a red tinge throughout, in its source of materials which are washed from the surrounding limestone and shale soils, in the absence of mica and other erratic materials, and in its occurrence along narrow valleys. In the flood plains of Turkey Creek and some of its larger tributaries, in places where they have cut into or through the Cedarville dolomite, the soil, in color, texture, and reaction, is, on the whole, comparable to Huntington silt loam, but it differs from the typical soil in that it carries considerable material from acid sandstone and acid shale, which is largely deposited in places where small tributaries flow into the larger streams. Around these junctions the soil may have an acid or slightly acid reaction. In the smaller valleys, most of the material adjacent to the streams is alluvial, and that lying at the bases of the valley slopes is colluvial, but in many places in the extremely narrow valleys these two classes of material have been thoroughly mixed.

Huntington silt loam is a soil which warms early. It is naturally fertile, as it contains a fair supply of organic matter. About 80 percent of the land is cultivated. Corn and tobacco are the leading crops, both of which return better than average yields, when not injured by frequent inundation.

Huntington silt loam, colluvial phase.—A colluvial phase of Huntington silt loam occurs along Ohio Brush Creek, along Moore Run and Beasley Fork east of Catbird School, and along a number

of small creeks north of West Union. This soil differs from the typical soil in that the material is largely colluvial from adjacent slopes occupied by Fairmount silty clay loam, in that it is grayish-brown silty clay loam to a depth of more than 30 inches, in that numerous irregular-shaped fragments of limestone are scattered over the surface and embedded in the surface soil and subsoil, and in that the material has a calcareous reaction throughout.

Huntington silt loam, high-bottom phase.—A high-bottom phase of Huntington silt loam occupies low terraces along Ohio River. This soil differs from typical Huntington silt loam in that it is subject to overflow about once in 2 or 3 years. Included with this soil are small areas along tributary streams of Ohio River, associated with soils included with Huntington silt loam, in which the soil materials are derived from limestone and shale formations. They resemble this soil in all respects, except that they are subject to overflow about once in 10 years.

Probably 90 percent of the land is cultivated. Because of higher natural fertility and equally favorable texture and consistence, yields of corn and tobacco, the more important crops, are higher than on Wheeling silt loam.

Huntington fine sandy loam.—Huntington fine sandy loam differs from Huntington silt loam in having a fine sandy loam texture to a depth of about 10 inches, where the material grades into gravelly fine sandy loam which, at a depth ranging from 2 to 6 feet, rests on beds of interstratified sand and gravel. In a few places the material is fine sand throughout.

This is a very inextensive soil. It occurs in a few long narrow areas in the lower flood plain along Ohio River. The land is inundated every spring, and destructive floods sometimes take place during the growing season.

This soil warms early and is easy to cultivate. About 80 percent of it is used for the production of corn and tobacco. Owing to droughtiness, yields are a little lower than on Huntington silt loam.

Williamsburg silt loam.—The main occurrence of Williamsburg silt loam is on the terraces of Ohio Brush Creek and its west fork. It is the dominant soil on the terraces of the tributaries to Ohio River in the Interior Low Plateaus section.

In cultivated fields the surface soil is grayish-brown or brown mellow friable silt loam to a depth of 8 or 10 inches. This material grades into yellowish-brown granular friable silty clay loam which, at a depth of about 24 inches, becomes mottled with shades of gray and yellow. Below a depth of 34 inches brownish yellow is the dominant color, and the gray mottlings are more numerous. In many places the entire soil is more friable than typical Williamsburg silt loam, and in such places the subsoil layers may be loam, fine sandy loam, very fine sandy loam, or fine gravelly loam. In a few small areas along Ohio Brush Creek, both surface soil and subsoil are very fine sandy loam.

With adequate drainage, this soil warms early. It is fertile and easily tilled. It has a fair supply of organic matter, suitable relief for the use of farm machinery, and good moisture-holding capacity, so that crops rarely suffer seriously from either a lack or excess of moisture. About 95 percent of the total acreage is cultivated. Corn,

wheat, tobacco, and hay are the important crops. Methods of tillage and fertilization are about the same as for Bratton silt loam. Corn yields average about 32 bushels an acre, wheat 12 bushels, tobacco 1,000 pounds, and hay 1 ton.

Williamsburg silt loam, mottled-subsoil phase.—In the vicinities of Lawshe and Marble Furnace on the terraces of Ohio Brush Creek are a number of areas in which the texture of the subsoil is heavier than that of the typical soil, and gray and yellow mottlings are present below a depth of 14 or 16 inches. The soil in such areas has been classed as a mottled-subsoil phase of Williamsburg silt loam. The land is in general flatter, is less well drained, and is slightly less desirable for cultivated crops than the typical soil.

Williamsburg silt loam, slope phase.—The slope phase of Williamsburg silt loam is very inextensive. It occurs on the escarpments of some terraces of Ohio Brush Creek north of Marble Furnace and below the junction of Beasley Fork with this creek. It differs from the typical silt loam in that it has a steep surface slope, good to excessive drainage, lighter texture throughout, and numerous inclusions of sandy loam and gravelly sandy loam. This soil is not cultivated but is used mainly as permanent pasture.

Dunkinsville silt loam.—Dunkinsville silt loam occurs on high terrace remnants along Ohio Brush Creek. The cultivated soil, to a depth of 8 inches, is grayish-brown friable silt loam. This is underlain by a light reddish-brown friable clay loam subsoil, and this material, with increase in depth, becomes more gravelly and friable, carrying many manganese and iron concretions, coatings, and streaks below a depth of 27 inches. It grades into reddish-brown gravelly or sandy highly weathered very friable acid clay loam at a depth of about 55 inches. At a greater depth the material becomes less acid and rests on a bed of calcareous gravel at a depth of about 96 inches. Much gravel is scattered over the surface. On the terrace escarpments the surface soil and much of the subsoil has been washed away, and the reddish-brown concretionary layer is exposed. Included with this soil east of Lawshe are about 80 acres of gravelly loam, where the material grades into stratified beds of gravel and sand at a depth of about 40 inches.

Approximately 80 percent of this soil is cultivated. It is used for the same crops as Williamsburg silt loam, and about the same yields are obtained.

Genesee silt loam.—Genesee silt loam is an extensive soil of the flood plains. It occurs largely in the glaciated section in the northwestern quarter of the county. Most of the materials composing this soil consist of wash from the Cincinnati, Rossmoyne, Fairmount, and Edenton soils.

The surface soil consists of brown, grayish-brown, dark-brown, or dark grayish-brown neutral mellow friable silt loam which passes very gradually, at a depth of 10 or 12 inches, into somewhat lighter colored material of slightly heavier texture, that is continuous to a depth ranging from 3 to 4 feet. Beneath this the material is rather sandy and in many places is calcareous. In many small bodies the sandy material is within 2 feet of the surface, and in some spots both the surface soil and subsoil are very fine sandy loam.

Small areas of other soils are included with this soil as mapped. In such areas both the surface soil and subsoil range in texture from very fine sandy loam to heavy silty clay loam. South of Spencer Hill the subsoil material is somewhat purple silty clay loam derived largely from the Crab Orchard shale. In sloughs, the color is dark grayish brown or dark brownish gray to a depth of about 15 inches. On the narrow bottoms of small streams the soil at the base of the valley slope is colluvial material, whereas that adjacent to the stream is alluvial; but in the narrower valleys these two classes of material have become thoroughly mixed.

This soil is well supplied with organic matter, lime, and available mineral elements, has a favorable texture, is retentive of moisture, and is easily cultivated; but occasionally it is subject to disastrous inundation during the growing season. About 50 percent of the land is cultivated. Corn is the principal crop, yields of which range from 45 to 50 bushels an acre. Tobacco, alfalfa, soybeans, and clover yield as well or better than on any other soil in the county. Bluegrass makes an excellent growth. Very little fertilizer is used.

Pope silt loam.—Pope silt loam is the most important and most extensive stream flood-plain soil of the Appalachian Plateaus section. The largest developments are along Blue Creek, Scioto Brush Creek, South Fork Scioto Brush Creek, and Rarden Creek. Along small tributaries of these streams, the soil material is largely colluvial along the bases of valley slopes and alluvial adjacent to the streams, and both kinds of material are derived from noncalcareous shale and noncalcareous sandstone formations.

The cultivated surface soil of Pope silt loam is brown mellow acid silt loam. This grades into yellowish-brown or grayish-brown acid subsoil material which is sandy below a depth of 24 inches. Rounded gravel and angular fragments of sandstone are strewn over the surface and embedded throughout the soil material, producing a markedly pervious character.

A combination of late spring rains and the usual seasonal overflow retards planting, but the pervious character, excellent drainage, and good aeration throughout, together with a fair supply of organic matter and a favorable texture for cultivation, cause this to be a highly desirable soil. About 80 percent of it is cultivated. In those areas occupying the higher levels, which are inundated only by higher floods that occur about once in 3 or 4 years, 30 percent of the land is devoted to corn, 20 percent to wheat, 15 percent to tobacco, 20 percent to meadow, and 15 percent to bluegrass pasture; but on the areas occupying the lower levels, which are subject to annual overflow, corn and hay are the principal crops. Corn yields average 45 bushels an acre, wheat 18 bushels, and tobacco 1,000 pounds. The tobacco, because of its color, brings a higher price than that grown on some other soils in the county.

Pope silt loam, high-bottom phase.—The high-bottom phase of Pope silt loam is similar to typical Pope silt loam except that it is somewhat more acid, is lower in content of organic matter, and is subject to less frequent overflows. The principal areas are along Turkey, Churn, and South Fork Scioto Brush Creeks. Along Dun-

lap and Scioto Brush Creeks several very small areas are included, in which the soil has the characteristics of a high-bottom phase of Philo silt loam.

About 90 percent of the land is cultivated. The crops grown are essentially like those grown on typical Pope silt loam, but the tobacco is a little better in quality, and wheat yields, because of less lodging, are somewhat higher. Yields of corn, owing to a lower supply of mineral elements and actively decomposing organic matter, are lower.

Pope gravelly silt loam, colluvial phase.—Pope gravelly silt loam, colluvial phase, occurs along Beech Fork, Churn Creek, Lower Twin Creek, and other small streams in the southeastern part of the county. It is of small extent. This soil is composed very largely of shale and sandstone materials which have washed or slumped down the valley slopes. In color and texture it resembles Pope silt loam but differs in that it contains gravel and is less subject to overflow.

A somewhat lower proportion of this land is cultivated than of Pope silt loam, but the crops grown, agricultural practices, and yields are similar on the two soils.

GRAYISH-BROWN POORLY DRAINED SOILS OF THE TERRACES AND BOTTOM LANDS

Soils with gray or grayish-brown well-drained surface soils and upper subsoil layers but poorly drained mottled lower subsoil layers, are represented in this county by Sciotoville silt loam in the shallow depressions on the Ohio River terraces, and by Philo silt loam on the flood plains, where the soil materials are derived from noncalcareous shale and noncalcareous sandstone materials. Sciotoville silt loam differs from Philo silt loam in that it is a terrace soil subject to overflow about once in 7 years; in having a smooth feel throughout, resulting from its high content of fine mica flakes; and in overlying calcareous parent materials.

Of the soils with gray surface soils and imperfect drainage throughout, Ginat silt loam and Chilo silty clay loam occur on the Ohio River terraces; and Lindside silt loam and Eel silt loam on the flood plains of tributaries of Ohio River in the Interior Low Plateaus section. The Ginat and Chilo soils occupy long narrow depressions parallel to Ohio River and are subject to inundation about once in 6 years. These two soils, like the brown well-drained soils of the Ohio Valley terraces, have a decidedly smooth feel caused by the presence of numerous small flakes of mica, and in this respect they differ from Lindside silt loam and Eel silt loam, which are soils of the flood plains. Chilo silty clay loam occurs at the bases of slopes occupied by the Fairmount and Eden soils and receives wash from these soils. This soil has a neutral or slightly alkaline reaction throughout, and this feature, together with the comparatively higher content of organic matter, distinguishes the Chilo soil from all other soils on the terraces in the county. The Lindside and Eel soils are neutral and poorly drained throughout.

Artificial drainage has been generally used to reclaim the Ginat and Chilo soils for cultivation. Before artificial drainage was in-

stalled, these soils remained completely submerged for a large part of the year, thereby affording a favorable environment for the accumulation of organic matter in the presence of water and in addition receiving a good supply of available mineral elements from the ground water; but with adequate drainage, they rank among the best in the county for corn, alfalfa, and red clover.

Sciotoville silt loam.—Sciotoville silt loam occurs in long shallow depressions parallel to Ohio River. The land is subjected to overflow about once in 10 years.

This soil consists of brown or light-brown friable silt loam to a depth of about 18 inches, where it grades into pale yellowish-brown heavy silt loam containing mottlings of gray and yellow; and this material, in turn, at a depth of about 30 inches, grades into mottled gray, brown, and yellow silty clay loam.

About 80 percent of the land is cultivated. Corn, wheat, and mixed clover and timothy are the leading crops, and some tobacco is grown. Owing to poor internal drainage, yields are lower than on Wheeling silt loam.

Philo silt loam.—Philo silt loam covers a total area of about 1 square mile on the flood plains of Scioto Brush Creek and its tributaries. The 8- or 10-inch surface soil is grayish-brown silt loam. It is underlain by yellowish-brown or brownish-yellow silt loam which passes, at a depth of about 17 inches, into mottled gray, brown, and yellow silt loam. Gravel and fragments of sandstone are scattered throughout the soil mass, and the reaction is acid. Except during spring floods, when the land is frequently inundated, surface drainage is good and internal drainage fair.

Along Scioto Brush Creek, its South Fork, and Turkey Creek, in flats, depressions, or seeped spots adjacent to bases of valley slopes, are very small areas of Atkins silt loam which have been included with Philo silt loam in mapping. In these included areas both surface and internal drainage are very poor. The surface soil is mottled dark-gray, gray, yellow, and rust-brown silt loam, and the subsoil is gray heavy silt loam or silty clay loam, strongly mottled with yellow and rust brown. Only in places where artificial drainage has been installed is such land tilled.

About 65 percent of Philo silt loam is cultivated, and the rest is in permanent pasture and wood lots. Corn, tobacco, and hay are the principal crops. Average yields, owing to imperfect internal drainage, are a little lower than on Pope silt loam.

Ginat silt loam.—Ginat silt loam occurs in small detached areas along Ohio River near Sandy Springs, near Brush Creek Island, and near the Brown County line.

The surface layer is gray or light-gray silt loam, to a depth of about 10 inches, where it is underlain by yellowish-gray silty clay loam containing yellow and gray mottlings. This soil must be worked when at the optimum moisture condition for pulverization, as it is sticky when wet and crusts on drying.

About 30 percent of the land is cultivated. Corn, wheat, and mixed clover and timothy are the leading crops. Owing to the low content of organic matter, acid condition throughout, and poor

drainage, yields on this soil are the lowest of those on the soils along the Ohio River.

Chilo silty clay loam.—Chilo silty clay loam is very inextensive. It occurs in a few small areas on terraces in the vicinity of Wrightsville. It differs from other soils of the terraces along Ohio River, in that it is dark-gray neutral or slightly alkaline silty clay loam to a depth of more than 30 inches. Because of its high content of clay, it must be worked under proper moisture conditions for pulverization.

About 90 percent of this soil is cultivated. In fields where artificial drainage is adequate, corn, the main crop, yields from 40 to 50 bushels an acre, and alfalfa makes a very heavy growth.

Lindside silt loam.—Lindside silt loam occurs in depressions along Ohio Brush Creek. Huntington silt loam areas flank it toward the stream, and Fairmount silty clay loam areas border it at the bases of the valley slopes. This soil also occurs on the flood plains along small streams in the vicinity and north of Peebles.

The soil differs from Huntington silt loam in its heavier texture throughout, poor internal drainage, and dark grayish-brown surface soil and grayish-brown lower subsoil layer mottled with gray, yellow, and brown.

In the vicinity of Palestine School south of Locust Grove, a variation of this soil is composed of colluvial material in sags or sloughs along small streams. It has a gray or dark-gray poorly drained silty clay loam surface soil underlain by a gray silty clay subsoil mottled with yellow and brown. Also combined with this soil, because of their small acreage, are areas on many very narrow flood plains, in which the soil is developed largely from colluvial material from the Crab Orchard formation. Such soil occurs in very small areas throughout the southwestern quarter of the county, and it has a 10-inch brownish-gray neutral silty clay loam surface soil underlain by yellowish-brown silty clay loam containing brown, yellow, and gray mottlings. This material, in turn, at a depth ranging from 20 to 30 inches, rests on brownish-gray shale fragments.

About 60 percent of Lindside silt loam is cultivated. Because of its high content of organic matter, neutral reaction, and high natural fertility, corn yields, in places where good underdrainage is provided, average 40 bushels an acre.

Eel silt loam.—Occurring in stream flood plains in poorly drained situations of the same general area as Genesee silt loam is Eel silt loam. Its surface soil is grayish-brown friable neutral silt loam which is underlain, at a depth ranging from 18 to 24 inches, by mottled grayish-brown, yellowish-brown, and gray friable somewhat heavier silt loam which continues downward to a depth ranging from 3 to 4 feet. The material beneath this is sandy.

Included with this soil as mapped are many small areas of Eel silty clay loam and a few of Eel silty clay, in which the soil material is very largely wash from the Fairmount and Eden soils. In some of the wetter places the surface soil, to a depth of 10 or 12 inches, is very dark gray silt loam.

Probably 5 percent of Eel silt loam is under cultivation. Most of the timber has been removed, and the land is in bluegrass pasture.

In places where good artificial drainage has been established, crops and yields are comparable to those on Genesee silt loam.

MANAGEMENT OF THE SOILS OF ADAMS COUNTY[7]

On the basis of soil-management problems, the soils of Adams County may be placed in eight groups, each of which presents problems peculiar to itself; and although certain of these problems exist in two or more groups, the degree of importance varies from group to group. The eight soil groups are as follows:

(1) Steep and rough uplands with soils derived from noncalcareous sandstone and shale. These soils are in the Appalachian Plateaus section in the eastern part of the county.
(2) Steep and rough uplands with soils derived from limestone and calcareous shale, limited largely to the southwestern part.
(3) Rolling uplands with soils derived from noncalcareous sandstone and shale, occurring in the eastern part.
(4) Rolling uplands with soils derived from limestone, occurring in the central and southwestern parts.
(5) Rolling uplands with fairly to well drained soils derived from Illinoian glacial drift, occurring in the northwestern part.
(6) Level uplands, with naturally poorly drained soils derived from Illinoian glacial drift, occurring in the northwestern part.
(7) Soils of the terraces.
(8) Soils of the flood plains.

STEEP AND ROUGH UPLANDS WITH SOILS DERIVED FROM NONCALCAREOUS SANDSTONE AND SHALE

In this group are the steep phases of the Muskingum, Latham, and Colyer soils. Because of their steep relief, these soils are not suited to farming, and the land should be devoted to forest. Areas that have been cleared should be planted to trees, preferably adapted species of pine.

STEEP AND ROUGH UPLANDS WITH SOILS DERIVED FROM LIMESTONE AND CALCAREOUS SHALE

The soils included in this group—the Fairmount, Eden, and Heitt silty clay loams—are more productive than the soils of group 1. The relief is steep, and erosion is such a hazard that farming is not practicable. The land is, however, well adapted to hardwood forest. Although farming of these soils should be discontinued, some areas will undoubtedly remain in general crop production for a number of years. In the meantime every possible effort should be made to utilize all adapted ways and means for the control of erosion, such as longer periods in grass between cultivated crops, more liberal use of fertilizers, strip cropping in very narrow strips, contour culture, and the gradual shift of the steepest areas to permanent pasture or forest. Details of practices for controlling erosion are discussed under group 3.

These soils are well suited to tobacco, alfalfa, and bluegrass. To meet the nutrient needs of crops the following recommendations are made: For tobacco: (1) alfalfa sod plowed under, and 300 to 400

[7] This section was written by D. R. Dodd, extension agronomist, Ohio State University.

pounds of 2–12–6 fertilizer in the row; (2) grass sod, and 400 to 600 pounds of 4–10–6 fertilizer in the row and 125 pounds of a nitrogen carrier as a side dressing; and (3) clover sod, and 400 to 600 pounds of 4–10–6 fertilizer in the row. If preceded by tobacco, small-grain crops, such as wheat or rye, derive ample nutrients from the residue left by the tobacco crop. Excellent alfalfa can be produced on these soils without liming, and this crop should be used more extensively in the rotation.

ROLLING UPLANDS WITH SOILS DERIVED FROM NONCALCAREOUS SANDSTONE AND SHALE

Because of their more favorable relief, the soils of this group offer better opportunities for farming than do the soils of the steep and rough uplands. The more important soils of the group are named in table 4 which gives a schedule for liming them.

TABLE 4.—*Important soils of group 3, and rate schedule for liming them*

Soil type	pH	Acre application of lime [1] to give pH 6.5	Soil type	pH	Acre application of lime [1] to give pH 6.5
		Tons			*Tons*
Muskingum silt loam	5.3	2½	Latham silty clay loam	5.6	1¾
Tilsit silt loam	5.3	2¾	Fawcett silt loam	5.3	2½
Rarden silt loam	5.4	2	Naceville silt loam	5.3	2½
Colyer silt loam	5.4	2			

[1] In terms of agricultural ground limestone.

These soils, for the most part, occupy rolling areas. As a general rule the areas having a slope of 20 percent or more, which are now in cultivated crops, should be retired to permanent pasture, and those with a slope of 35 percent or more, now in permanent pasture, should be planted to forest. Regardless of slope, most of the areas that are already severely eroded cannot be made to yield profitable crops. Therefore, in places where 50 percent or more of the surface soil has been washed away, the land should be thought of as future pasture rather than as cropland, and those areas in which the surface soil has been entirely removed to plow depth or below, should be considered as potential forest land. Badly gullied areas, regardless of location, should be planted to trees.

Profitable production of crops on these sloping lands is possible only where adequate measures are taken for the control of erosion. Such measures include the use of only the more gentle slopes for cultivated crops, maintenance of a high level of productivity, rotations including a high proportion of sod crops, strip cropping, and contour cultivation.

The crops commonly grown on these soils include corn, small grains, and hay. Three 5-year rotations, with suggestions for the use of fertilizer, are given in table 5.

TABLE 5.—*Three recommended 5-year rotations including, or in preparation for, alfalfa*

(A) FOR LAND ADAPTED TO ALFALFA (pH 6.5 TO 7.0)

Year	Crop	Manure	Fertilizer
First	Corn	6 tons on sod before plowing	125 pounds of 0-14-6 in hill, or 200 pounds of 0-14-6 in row.
Second	Wheat or other small grain.	4 tons as top dressing on winter grains.	300 pounds of 0-14-6.
Third	Hay [1]		
Fourth	do	6 tons reinforced with 200 pounds of superphosphate or 250 pounds of 0-14-6 during previous fall or winter.	
Fifth	do	do	

(B) FOR LAND MODERATELY ADAPTED TO ALFALFA (pH 5.8 TO 6.4)

Year	Crop	Manure	Fertilizer
First	Corn	6 tons on sod before plowing	125 pounds of 0-14-6 in hill, or 200 pounds of 0-14-6 in row.
Second	Wheat or other small grain.	4 tons as top dressing on winter grain.	300 pounds of 0-14-6.
Third	Hay [2]		
Fourth	do	6 tons reinforced with 200 pounds of superphosphate or 250 pounds of 0-14-6 during previous fall or winter.	
Fifth	do	do	

(C) FOR LAND NOT ADAPTED TO ALFALFA (pH 5.2 TO 5.7) [3]

Year	Crop	Manure	Fertilizer
First	Corn	6 tons on sod before plowing	125 pounds of 0-14-6 in hill, or 200 pounds of 0-14-6 in row.
Second	Wheat or other grain.	4 tons as top dressing on winter grains.	300 pounds of 2-14-4.
Third	Hay [4]		
Fourth	do	6 tons reinforced with 200 pounds of superphosphate or 300 pounds of 10-6-4 before April 1.	
Fifth	do	do	

[1] Acre seeding: 12 pounds of alfalfa and 3 of timothy.
[2] Acre seeding: 4 pounds of alfalfa, 4 of red clover, 2 of alsike clover, and 4 of timothy.
[3] Should be limed to bring to A or B levels as soon as possible.
[4] Acre seeding: 4 pounds of red clover, 3 of alsike clover, 5 of timothy, and 2 of redtop.

The grass crop included in the rotation will depend on the reaction of the soil. Generally, for the soils of this group, the pH is below 5.5, and the lime required to give a reaction favorable for alfalfa (pH 6.5) is 2 tons or more to the acre. In general farming combined with livestock raising, maximum use should be made of legume hays. With proper lime and fertilizer applications alfalfa-grass mixtures may be very generally grown on these soils.

The quantity of manure indicated in the rotation is in excess of that which will generally be available. In such event the application on meadow the second year or that just prior to corn may be omitted. These rotations are merely suggestive. Others involving the same principles better suited to individual farms may be worked out to meet the particular farm conditions.

Strip cropping, in which cultivated crops are alternated with sod or small-grain crops in narrow strips following the contour of the land, offers an effective means of minimizing the loss of soil by erosion. With such an arrangement the length of the slope is insufficient to allow run-off of rainfall from the cultivated area to attain sufficient speed to pick up much soil, and most of the soil carried off the cultivated area will be deposited on the strip of sod below.

The width of the strips will depend chiefly on the slope but may also be varied with the soil types and levels of productivity. Since soils of low productivity erode more readily than those of high productivity, other things being equal, the less productive soils should be handled in narrower strips. Likewise, soils derived from sandstone and shale erode more readily than those of limestone origin and therefore should be laid out in narrower strips. As a general rule, however, it has been suggested that slopes of 8 percent be laid out in 100-foot strips and that 5 feet be deducted for each 1-percent increase in slope. On this basis, a 120-foot strip could be used on a 4-percent slope, and an 80-foot strip on a 12-percent slope. For further information on strip cropping and other means of controlling erosion, see Extension Bulletin 186, Agricultural College Extension Service.[8]

As a large part of the area of these soils is in permanent pasture, their management and improvement are of considerable importance. A large proportion of the pastures is of poor quality and low carrying capacity. In the improvement of pastures the use of lime is the first essential, and the quantity necessary should be determined by testing the soil. The application can be made directly on the surface of the soil at any convenient time, usually in the summer or fall. On steep land or where the vegetation is thin, grooving on the contour with a disk harrow will allow better incorporation of lime. The application should be repeated when needed, as determined by the type of vegetation and further soil tests. Generally speaking, this is every 6 or 8 years.

Fertilizer, at the rate of 400 to 500 pounds an acre, of 20-percent superphosphate or 0–14–6, should be placed in the soil at a depth of 1 or 2 inches, by means of a disk drill running on the contour. The most satisfactory time of application is between October 1 and April 1. This application should be repeated every 4 or 5 years.

Manure is not extensively used on permanent pastures. On thin sods, however, it may be a very effective means for the improvement of pastures. The common rate of application is from 6 to 8 tons an acre. Each ton should be supplemented with 40 pounds of 20-percent superphosphate or its equivalent. This treatment may be repeated every 3 or 4 years.

As a general rule, reseeding will not be necessary, as the desirable grasses and clover will increase rapidly following the use of soil amendments. In places where very rapid improvement is desired, however, where less than 50 percent of the land is covered by vegetation, or where the proportion of desirable grass and clover is below 5 percent, reseeding with from 5 to 10 pounds an acre of the following seed mixture is desirable: 7 pounds of Kentucky bluegrass, 4 pounds of timothy or orchard grass, 3 pounds of redtop, 3 pounds of alsike clover, and 1 pound of white clover. Three pounds of Korean lespedeza and 3 pounds of common lespedeza used in connection with this seed mixture or seeded separately on thin pastures will prove very helpful in producing more pasture in midsummer, also in the control of erosion.

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[8] DODD, D. R. EROSION CONTROL IN OHIO FARMING. Ohio Agr. Col. Ext. Bull. 186, 40 pp., illus. 1937.

On badly eroded areas within a pasture, after treatment with lime and fertilizer and reseeding, it may be desirable to cover the land with brush to protect it from grazing until the sod has become established. In gullied areas, it is necessary to provide some temporary control of water until a sod can be established in the gully, through the use of sod, wire, brush, slot, or low stone dams. The gully banks are then graded back, limed as needed, liberally fertilized, and seeded. Orchard grass should always be included in the mixture for seeding gullies. The temporary exclusion of livestock by the use of brush or by fencing is necessary for development of a good sod on gullied areas.

Regardless of how well permanent pastures are limed and fertilized, satisfactory sod will not develop, and a good sod cannot be maintained, unless careful attention is given to care and management. The ideal practice seems to be to so graze that the vegetation may be kept at a height between 1½ and 5 inches at all times, but not continuously as short as 1½ inches. If the vegetation can be maintained at the heights indicated, a white clover-bluegrass sod will develop rapidly. Particular care should be taken not to overgraze in early spring or in July and August.

ROLLING UPLANDS WITH SOILS DERIVED FROM LIMESTONE

Group 4 includes the soils listed in table 6 besides several others.

TABLE 6.—*Soils of group 4, with ordinary reactions and suggested applications of lime*

Soil type	pH	Acre application of lime [1] to give pH 6.5	Soil type	pH	Acre application of lime [1] to give pH 6.5
		Tons			*Ton*
Hagerstown silt loam	6.3	¾	Ellsberry silt loam	6.3	¾
Bentonville silt loam	6.3	¾	Eden silt loam	7.0	0
Bratton silt loam	6.3	¾	Edenton silt loam	7.0	0
Otway silt loam	6.0	1¼	Heitt silt loam	7.0	0
Jacksonville silt loam	6.3	¾	Burgin silty clay loam	7.0	0
Maddox silt loam	6.3	¾			

[1] In terms of agricultural ground limestone.

With minor exceptions the soils of this group are greatly affected by erosion unless carefully managed. What has been said for the soils of group 3 with reference to forest, pasture, and crop land also applies to the soils of this group, with the following exceptions and modifications: (1) The lime requirement is lower, and the natural adaptation to alfalfa and alfalfa mixtures and bluegrass pasture is better. (2) The slope of land devoted to general field crops and pastures may be increased by about 5 to 10 percent without any greater danger of erosion than with the more gentle slope limits specified for soils in group 3. (3) The amount of alfalfa included in seed mixtures may be a little greater and that of clovers a little less than specified for soils in group 3. (4) Since the area is suited to good pasture, and erosion under general crop production is serious, livestock enterprises should receive further consideration. The

pastures should be maintained in good quality, producing sods by means of treatments outlined for the soils of group 3. (5) Tobacco does well and may be used as a substitute for corn in such rotations as are given in table 5 for the soils of group 3. Liberal use of fertilizers in the row is advisable. Where the application of manure is 8 tons or more an acre, or where a heavy growth of clover or alfalfa is plowed under, the fertilizer may consist of 300 to 400 pounds of 2–12–6 an acre in the row. In most instances, however, 400 to 600 pounds of 4–10–6 will give better results. (6) Some of the more level areas, such as the Maddox and Ellsberry soils, can be used for soybeans without important loss of soil. When soybeans are grown they may replace corn or may follow the corn and precede the wheat. The land should receive an application of about 200 pounds of 0–20–0 to the acre, drilled when seeding the beans. Generally, however, soybeans are not suited to soils of this group, owing to the great hazards from erosion.

ROLLING UPLANDS WITH FAIRLY TO WELL DRAINED SOILS DERIVED FROM ILLINOIAN GLACIAL DRIFT

In group 5 are the soils listed in table 7.

TABLE 7.—*Important soils of group 5, with ordinary reaction, and suggested applications of lime*

Soil type	pH	Acre application of lime[1] to give pH 6.5	Soil type	pH	Acre application of lime[1] to give pH 6.5
		Tons			*Tons*
Cincinnati silt loam	5.7	2	Rossmoyne silt loam	5.6	2½
Jessup silt loam	5.8	1¾	Loudon silt loam	5.5	2½

[1] In terms of agricultural ground limestone.

Generally speaking, the slopes are more gentle, erosion less severe, and the adaptation to the production of general field crops better than in the soils of groups 3 and 4. Therefore, if occasion demands, the relative percentages of cultivated crops in the rotation may be increased and that of sod crops decreased, in comparison with the soils of group 3. If a high level of production be maintained and suitable means for prevention of erosion be employed, there will be little danger of excessive losses from soil erosion. Where conditions allow, strip cropping should be practiced and a fairly high organic-matter content maintained in the soil at all times.

Because of the more gentle slopes and less danger from erosion, soybeans may be included in the rotation as a substitute for corn or as an extra crop between the corn and grain as outlined in table 5 for the soils of group 3. Occasionally, if new seedings fail, soybeans may be seeded as a special hay crop. In either case, where liberal manuring has been followed the fertilizer should consist of about 200 pounds of 0–20–0. In places where the application of manure has been light or has been omitted, a 200-pound application of 0–14–6 will prove better.

These soils are not so well adapted to tobacco as those of group 4. Considerable tobacco is produced, however, and this practice probably will be continued. The fertilizing plan should be the same as that outlined for tobacco on the soils of group 4. Pastures on these soils are responsive to treatment and should receive periodic applications of lime and fertilizer as outlined for the soils of group 3.

LEVEL UPLANDS WITH NATURALLY POORLY DRAINED SOILS DERIVED FROM ILLINOIAN GLACIAL DRIFT

The most important soils in group 6 are listed in table 8.

TABLE 8.—*Important soils of group 6, with ordinary reaction and suggested applications of lime*

Soil type	pH	Acre application of lime [1] to give pH 6.5	Soil type	pH	Acre application of lime [1] to give pH 6.5
		Tons			*Tons*
Clermont silt loam	5.2	3	Avonburg silt loam	5.4	2¾

[1] In terms of agricultural ground limestone.

The soils of this group are difficult to handle, and crop failures are frequent. Extreme care must be used to keep them in good physical condition if profitable yields are to be obtained. Even though tiling has given comparatively small returns, some type of drainage must be provided. Shallow open ditches have given good results.

In the past, because of the difficulty of getting good meadow seedings in grain crops, stubble land has frequently been rebroken for corn, wheat, or soybeans. This has further reduced the organic-matter content and the available nutrients, making a second failure likely. Other things being equal, the greater the proportion of sod in the rotation and the better the sod, the greater will be the content of organic matter and the better the physical condition of the soil.

Another factor that has contributed to poor physical condition and low yields on these soils is the length of time that some of them are bare of surface cover. This condition may be overcome by adjustments in the rotation and the maintenance of a higher level of productivity.

In order to meet the above conditions, the rotations given in table 5, under group 3, are recommended. The idea of growing alfalfa on Clermont soil may seem farfetched, and it is, so long as these soils are in their present condition. They cannot be made over in a year or two. At first, the farmer will probably have to be satisfied with rotation C. The next, and probably the most essential, step in improvement is the addition of lime. Next in importance is the application of manure as a top dressing on the grain crop in which the new seeding is being made, and the further application of manure to the sod where the meadow is maintained for three or more years. The same fertilizing program is recommended as that indicated in table 5.

Where new seedings fail, the land should be disked immediately after grain harvest and worked into a fine firm seedbed. If plowing is necessary for the control of weeds it should be shallow. The new

seeding may be made in August or early September, as soon as the soil can be put into final condition following sufficient rain to wet the soil to ordinary plow depth; 200 pounds of 2–12–6 should also be used when making the seeding. The seed may be drilled or broadcast and should be forced in close contact with the soil by going over it with a cultipacker. Care should be used not to cover the seed too deeply. Two or three weeks should elapse between the beginning of preparation of the soil and the date of seeding, in order to allow further accumulation of soil nutrients and moisture.

Areas devoted to pasture are no less important and should be maintained in a good state of productivity after the manner outlined for the soils under group 3. There is, however, a large acreage of wet pasture land in this group, that will not show much improvement unless proper drainage is provided.

SOILS OF THE TERRACES

These soils in Adams County are not extensive and are limited largely to the Ohio River Valley, but small areas occur along minor streams. Although all soils of the group are acid, those of the tributary stream valleys generally have a higher lime requirement than those of the Ohio River Valley. The well-drained soils of the Ohio Valley are generally excellent for truck crops and, where markets are available, should be used for that purpose. The poorly drained soils, however, are little adapted to any use other than pasture. The soils of the minor stream terraces may also be used for truck crops, but those having a high lime requirement and a heavier texture are better adapted to general crop production than to trucking. Naturally well drained soils on the Ohio River terraces not required for truck crops may be used to advantage for general field crops, particularly tobacco and alfalfa. The important soils of this group are included in table 9.

TABLE 9.—*Important soils of group 7, with ordinary reaction and suggested applications of lime*

Soil type	pH	Acre application of lime [1] to give pH 6.5	Soil type	pH	Acre application of lime [1] to give pH 6.5
		Tons			*Tons*
Wheeling sandy loam	5.7	1	Chilo silty clay loam	7.0	0
Wheeling silt loam	5.8	1½	Williamsburg silt loam	5.8	1¾
Sciotoville silt loam	5.8	1½	Dunkinsville silt loam	5.6	2¼
Ginat silt loam	5.6	2¼			

[1] In terms of agricultural ground limestone.

Rotations suggested in table 5 are well adapted to soils of this group, but alfalfa may be more generally included and the rotation may be shortened to 3 or 4 years. It is important that the potash content of the fertilizer for the more sandy soils be kept fairly high. The 0–10–10 or 0–12–12 fertilizer may well replace the 0–14–6, and the 2–12–6 replace the 2–14–4. In the case of tobacco, in places where

manure is freely used or where heavy leguminous crops are plowed under, 400 pounds or more of a 2–12–6 fertilizer may be used in the row. In places where the application of manure is light or the preceding legume crop poor, from 500 to 600 pounds of a 4–10–6 or 4–8–8 fertilizer will prove better. The application of fertilizer for grain following tobacco thus liberally fertilized may be very light or even omitted.

Truck crops have special requirements and will not be discussed here, except to advise the free use of cover crops, manure, and fertilizers fairly high in potash.

SOILS OF THE FLOOD PLAINS

This group includes the most productive soils of the county. In areas where the soils are not seriously damaged by floods and where drainage is good, a wide selection of crops may be used and high yields obtained. Here the best adaptation is to corn, alfalfa, and truck crops, and the poorest to small-grain crops. The important soils of the group are given in table 10.

TABLE 10.—*Important soils of group 8, with ordinary reaction and suggested applications of lime*

Soil type	pH	Acre application of lime [1] to give pH 6.5	Soil type	pH	Acre application of lime [1] to give pH 6.5
		Ton			*Tons*
Huntington fine sandy loam	7.0	0	Genesee silt loam	7.0	0
Huntington silt loam	7.0	0	Eel silt loam	7.0	0
Huntington silt loam, high-bottom phase	6.5	0	Pope silt loam	5.6	2
Lindside silt loam	7.0	0	Philo silt loam	5.6	2¼

[1] In terms of agricultural ground limestone.

In addition to having a very low or no lime requirement, these soils have a low fertilizer requirement and are less responsive to manure than the upland soils. Applications of fertilizer should be about one-half or two-thirds as heavy as those indicated in rotations A and B, table 5.

The grass may be omitted from the alfalfa seeding and the rotations shortened to 3 years. Truck crops may replace corn in the rotation but should receive a heavier application of fertilizer. The potash content of the fertilizer should be high and the analyses about the same as those mentioned for the soils of group 7. Although these are the easiest soils to farm, it should be kept in mind that it is cheaper to maintain good soils than to build them up after they have become depleted. Care should be used to see that legumes are grown at least 1 year in 3, and light applications of manure and fertilizer should be used regularly.

Table 11 gives the productivity ratings of most of the soils of Adams County. A few of the less important separations have been omitted.

TABLE 11.—*Productivity ratings for the soils of Adams County,*

SOILS OF THE UPLANDS

Soil type	Productivity rating	Crop-producti			
		Corn	Wheat	Oats	Mixed hay
Edenton silt loam [2]	8	5(6)	5(7)	5(6)	7(8)
Cincinnati silt loam	5	4(6)	4(6)	3(4)	3(6)
Jessup silt loam	5.5	3(6)	3(6)	3(4)	3(6)
Rossmoyne silt loam	5.5	3(6)	3(6)	3(4)	3(5)
Loudon silt loam	6.0	2(5)	2(5)	3(4)	3(5)
Avonburg silt loam	6.5	2(5)	1(5)	1(3)	2(4)
Clermont silt loam	7	1(4)	1(4)	1(3)	2(4)
Maddox silt loam	4	4(7)	4(6)	4(6)	5(8)
Ellsberry silt loam	4	4(7)	4(6)	4(6)	5(8)
Ellsberry silty clay loam [2]	5	3(6)	3(6)	4(6)	5(8)
Eden silt loam	6	5(6)	5(7)	5(6)	7(8)
Eden silty clay loam [2]	8	5(6)	5(7)	5(6)	7(8)
Fairmount silty clay loam [2]	8	5(6)	5(7)	5(6)	8(9)
Heitt silt loam	8	5(6)	5(7)	5(6)	7(8)
Heitt silty clay loam [2]	8	5(6)	5(7)	5(6)	7(8)
Hagerstown silt loam	3	5(8)	6(8)	5(6)	5(8)
Bentonville silt loam	5.5	3(5)	4(6)	3(5)	4(7)
Otway silt loam	7	1(4)	1(5)	1(3)	2(4)
Otway silty clay loam	7.5	1(4)	1(4)	1(3)	2(4)
Bratton silt loam	3	5(8)	6(8)	5(6)	5(8)
Bratton stony silt loam, steep phase	9				
Cedarville silt loam	3	5(8)	6(8)	5(6)	5(8)
Burgin silty clay loam	4	2(8)	2(6)	2(6)	4(8)
Fawcett silt loam	6	3(5)	4(6)	3(5)	4(6)
Colyer silt loam, deep phase	6	3(5)	4(6)	3(5)	4(6)
Colyer silt loam	9				
Colyer silt loam, steep phase	10				
Naceville silt loam	4.5	4(6)	5(8)	4(6)	4(7)
Latham silty clay loam	6	3(5)	5(7)	3(5)	4(7)
Latham silty clay loam, steep phase	10				
Muskingum silt loam	4.5	4(6)	5(8)	4(6)	4(7)
Muskingum silt loam, deep phase	4	4(7)	5(8)	4(6)	4(8)
Muskingum silt loam, steep phase	9				
Muskingum silt loam, very steep phase	10				
Rarden silt loam	4.5	4(6)	5(8)	4(6)	4(7)
Tilsit silt loam	5	3(6)	4(7)	3(5)	4(7)

Footnotes at end of table.

TABLE 11.—*Productivity ratings for the soils of Adams County, Ohio—*

SOILS OF THE TERRACES

Soil type	Productivity rating	Crop-productiv			
		Corn	Wheat	Oats	Mixed hay
Wheeling silt loam	3	5(7)	6(9)	5(6)	6(8)
Sciotoville silt loam	4	4(6)	4(7)	4(6)	5(7)
Ginat silt loam	6	1(4)	1(5)	1(5)	3(5)
Williamsburg silt loam	5	4(6)	4(6)	3(5)	4(6)

SOILS OF THE FLOOD PLAINS

Soil type	Productivity rating	Corn	Wheat	Oats	Mixed hay
Huntington silt loam	2	9(10)	5(6)	7(8)	9(9)
Lindside silt loam	3	5(9)	4(5)	4(6)	5(8)
Genesee silt loam	2	9(10)	5(6)	6(7)	9(9)
Eel silt loam	3	4(7)	3(4)	4(6)	5(8)
Pope silt loam	4	7(8)	6(7)	6(7)	7(8)
Philo silt loam	5	4(7)	4(5)	3(5)	6(8)

[1] Data furnished by G. W. Conrey, in charge of soil survey, Ohio Agricultural Experiment Station.
[2] Because of its steepness, cultivated crops can be grown on this soil only once in 5 to 8 years.

To explain the figures in the table the following quotation is taken from Ohio Agricultural Experiment Station Special Circular 44:[9]

Two different ratings are used in the tables: First, a State-wide productivity rating and, second, a crop-producing rating or crop-productivity index. In the State-wide productivity rating the most productive soil (with good soil management) is rated as 1 and the least as 10. In the crop-production rating or crop-productivity index, the most productive soil for any given crop is rated as 10, and all other values are lower. A soil with an index of 5 will yield only one-half as much as one with an index of 10. Two values are given for each crop—the first, for the soil without artificial drainage, fertilizer treatment, manure, or lime, and the second with adequate drainage and a good system of soil management (including the use of manure and fertilizer and of lime where the soil is acid).

For example, the productivity rating for Bratton silt loam is 3, as compared with 1 for the most productive soil in the State. For this same soil type the crop-productivity index for corn 5 (8) is 5 without special treatment, and 8 with adequate drainage and good soil management, as compared with 10 for the best soil for corn in the State.

MORPHOLOGY AND GENESIS OF SOILS

Adams County is in the region of Gray-Brown Podzolic soils, which extends from the Atlantic coast to western Indiana. The soils have developed under the influence of a humid temperate climate, and the amount of rainfall has been, in general, sufficient to compensate the loss of moisture caused by evaporation and surface run-off and, in addition, to afford a supply for downward movement through the soil throughout much of the year.

With the exception of very small areas, the soils are light colored, owing to the fact that they have been formed under a dense forest cover which was unfavorable to the accumulation of organic matter in the soil. Fully developed soils occur on the well-drained ridges and terraces, where soil processes, unimpeded by excessive erosion or imperfect drainage, have so modified the soil materials that the original geologic characteristics have given place to the subsequently developed true soil characteristics. Where the land on ridges and terraces is nearly level, the normal soil characteristics, largely owing to poor or imperfect drainage, are not so well developed. A very large proportion of the land in the county is steep, ranging from 15 percent to 55 percent slope. On such land, run-off has been rapid, leaving less water in the soil for plants and consequently retarding soil development; leaching has been less complete; and erosion has been above normal; so that well-developed soils have not been formed. The A horizons in many places consist of a layer of dark organic material a few inches thick, and the soil throughout is largely disintegrated parent material. Thus, it is evident that parent materials and substrata play an important role in determining the characteristics of soils of the steeper slopes.

According to their parent materials and physiographic relationships, the soils of this county naturally may be placed in four important groups: (1) Those derived from limestone, dolomitic limestone, and calcareous shale materials in the Interior Low Plateaus

[9] CONREY, G. W., and PASCHALL, H. H. A KEY TO THE SOILS OF OHIO. Ohio Agr. Expt. Sta. Spec. Cir. 44, 31 pp., illus. 1934.

section, in the central and southwestern parts of the county, prevailingly featured by various-sized ridges with steep slopes and deep valleys; (2) those derived from glacial till consisting of limestone, dolomitic limestone, and calcareous shale materials of Illinoian age in the northwestern quarter, where the relief ranges from undulating to gently rolling; (3) those derived from noncalcareous sandstone and noncalcareous shale materials in the Appalachian Plateaus section, a highly dissected area embracing the eastern part; and (4) those derived from alluvial materials. In the soils of the first group carbonates have been leached to a depth ranging from 4 to 5 feet, in those of the second group from 6 to 11 feet, and in the third group they are entirely absent. The soils of the fourth group are acid, neutral, or calcareous, depending largely on the character of the parent soil material.

Marked differences in forest [10] growth are significant in the several groups. On the soils of the first group, white oak (*Quercus alba*), tuliptree (*Liriodendron tulipifera*), red oak (*Q. rubra*), scarlet oak (*Q. coccinea*), black oak (*Q. velutina*), sour gum or black gum (*Nyssa sylvatica*), chinquapin oak (locally called chestnut oak) (*Q. muhlenbergii*), red maple (*Acer rubrum*), hickory (*Hicoria* (*Carya*) *alba*), sugar maple (*Acer saccharum nigrum*), white ash (*Fraxinus americana*), red mulberry (*Morus rubra*), dogwood (*Cornus florida*), papaw (*Asimina triloba*), and black (wild) cherry (*Prunus serotina*), are the more common trees of the limestone (Brassfield) and dolomitic limestone (Bisher and Cedarville) ridges; and over calcareous shale (Crab Orchard) slopes grow, for the most part, sugar maple (*Acer saccharum* and *A. saccharum nigrum*), walnut, blue ash, basswood, or American linden (*Tilia americana*), ironwood (*Carpinus caroliniana*), tuliptree, redbud (*Cercis canadensis*), spicebush (*Benzoin aestivale*), bladdernut (*Staphylea trifolia*), and Carolina buckthorn, locally called skunk tree (*Rhamnus caroliniana*). Of the soils derived from glacial till, the well-drained soils on the ridges and gentle slopes of the glaciated section, embracing most of the northwestern quarter of the county, support a dominant tree growth of beech (*Fagus grandifolia*), sugar maple, white oak, black oak, white ash, hickory, and wild cherry; whereas the more important trees over gray poorly drained soils include shagbark (shellbark) hickory (*Hicoria* (*Carya*) *ovata*), beech, white oak, swamp white oak (*Quercus bicolor*), red maple, pin oak (*Q. palustris*), whiteheart hickory (*Hicoria alba*), white ash, shingle oak (*Q. imbricaria*), sour gum, and American (white) elm (*Ulmus americana*). Mesophytes, such as red elm, walnut, redbud, hackberry, mulberry, and sassafras make up a large proportion of the young trees. On the soils of the steep slopes the principal trees are sugar maple, white oak, red oak, tuliptree, black locust, beech, and red elm. In the third group of soils, those derived from acid sandstones and shales, chestnut oak (*Quercus prinus*), sourwood (*Oxy-*

[10] The descriptions of forests in this chapter are taken from Ohio Biological Survey Bulletin 15, by E. L. Braun, who determined the character of vegetation over various geologic formations under ridge, valley-slope, and valley-floor conditions by a very detailed study of limited transects. The common and botanical names of the trees were further revised from the following publication: SUDWORTH, G. B. CHECK LIST OF THE FOREST TREES OF THE UNITED STATES, THEIR NAMES AND RANGES. U. S. Dept. Agr. Misc. Cir. 92, 295 pp. 1927.

dendrum arboreum), red maple, chestnut (*Castanea dentata*), and tuliptree predominate on the brown soils of noncalcareous sandstone ridges and slopes; whereas over noncalcareous shale slopes scarlet oak is the most important tree.

In this county about 27 percent of the area has soil material derived from noncalcareous sandstone (Waverly), 9 percent from noncalcareous shale (Ohio), 11 percent from dolomitic limestone (Bisher, Lilly, and Cedarville), 2 percent from limestone (Brassfield), 7 percent from calcareous shale (Crab Orchard), 11 percent from interstratified calcareous shale and limestone (Richmond), and 25 percent from glacial till (Illinoian). About 10 percent of the area has alluvial soil material, of which 5 percent occurs on stream terraces and 5 percent in stream flood plains.

Through the processes of soil development, the surface soils developed from these soil materials have been reduced to a more uniform composition as regards texture and consistence. The most outstanding characteristics of typically developed virgin soils are a thin accumulation of organic matter (the A_0 layer), a thin dark-colored layer of mixed mineral material and humus (A_1), a thin gray layer (A_2) indicative of maximum leaching, a relative accumulation of silica in the A horizon, and an accumulation, in the B horizon, of fine materials and sesquioxides translocated from the A horizon, as shown by the higher content of clay and more red coloration than occurs in either the A or C horizons.

These soil characteristics exist in the mature soils of the first and second groups, and are partly developed in those of the third and fourth groups. For the purpose of discussion, a representative soil from each group will be described, after which will be shown its relation to other soils in the same group.

A virgin soil profile of Bratton silt loam, 2½ miles southeast of Dunkinsville on a gentle ridge slope, where both surface and internal drainage are good, is selected as representative of soils of the first group. From the surface downward, the profile of this soil, in the air-dried condition, may be described by horizons, as follows:

A_0. A thin surface covering of very dark brown organic matter composed of leafmold, litter, and humus. The reaction is slightly acid.

A_1. ¼ to 2½ inches, a layer of mixed mineral and organic material consisting of dark grayish-brown friable pervious silt loam well filled with fine roots. This material breaks readily into small pellets which cling to the rootlets and has a distinctly laminated structure. The reaction is slightly acid.

A_{11}. 2½ to 3½ inches, light reddish-yellow friable silt loam with a distinct gray tinge caused by organic matter. The material in this layer contains numerous streaks where the dark grayish-brown material from the overlying layer has sifted down through old root channels and worm burrows. The reaction is strongly acid.

A_2. 3½ to 6 inches, the upper part of the layer in which maximum leaching has taken place. The material is light reddish-yellow finely vesicular friable silt loam which breaks down into single grains but when shaken out clings in small lumps (1 or 2 millimeters in diameter) to rootlets. From the surface downward the acidity increases, and in this layer the maximum degree of acidity is attained. This points to the transference of bases from the roots upward through the sap to the leaves which, on decomposing, leave bases as a residue in the surface layer.

A_{21}. 6 to 12 inches, finely vesicular friable silt loam which, in the lower part, has more of the red color and a little heavier texture, indicative of its transition to the illuvial horizon. The reaction is strongly acid.

B_1. 12 to 25 inches, friable reddish-yellow silty clay loam which readily breaks into structure blocks ranging from 1 to 6 millimeters in diameter. The red color is more pronounced on the outsides of the structure blocks and the yellow more pronounced within. Gray streaks, where the iron has been reduced along root channels, are apparent. The red color and heavier texture than in the layers above show the accumulation of iron and fine material, both of which characterize the illuvial horizon.

B_2. 25 to 31 inches, the red color is more pronounced, the texture is somewhat heavier, and the structure fragments are a little larger than in B_1. The surface coatings of the structure fragments are reddish brown, and their interiors range from reddish yellow to yellowish brown. A few manganese and iron concretions are present. The reaction is strongly acid.

B_{21}. 31 to 39 inches, yellowish-red compact silty clay loam which breaks into irregularly shaped structure fragments, ranging in diameter from 2 to 12 millimeters. The faces of these fragments are slickened. Manganese and iron concretions, coatings, and streaks are more numerous. The reaction is strongly acid.

C_1. 39 to 60 inches, yellowish-red or red parent material having a silty clay loam texture. The reaction is strongly acid, the material in this layer having a lower pH value than that in any layer in the B horizon.

C_2 60 to 65 inches, reddish-brown light silty clay with yellowish brown mottlings and some partly disintegrated crystals of dolomite, which resemble fine sand. The reaction is alkaline.

C_3. 65 to 68 inches, yellow very fine sand which consists of dolomitic crystals.

68 to 72 inches +, the substratum of disintegrated dolomitic limestone.

Many roots are present throughout the soil mass, and the larger ones penetrate the disintegrated dolomitic limestone. The Hagerstown soils have profiles resembling the Bratton soils but are unlike those soils in that they have more red color throughout the solum, a C horizon consisting of brownish-yellow or reddish-brown silty clay with olive-colored mottlings, and a limestone substratum carrying seams or lenses of calcareous shale.

The Cedarville soils differ from the Hagerstown and Bratton soils in having thinner B horizons, the underlying formation (marl member of Cedarville dolomite) being within 24 inches of the surface, and the C horizon consisting largely of disintegrated dolomitic limestone with some reddish-brown silty clay. In many places, the A horizon is thin, due to erosion and limited vegetal growth. The Maddox, Bentonville, Ellsberry, Jacksonville, Heitt, Eden, and Fairmount soils differ from the Bratton and Hagerstown soils in that they have heavier B and C horizons, and therefore more restricted subsoil drainage, and in having substrata of interstratified limestone and calcareous shale. The Maddox and Ellsberry soils occur on narrow ridges and gentle slopes, the Bentonville on broad undulating ridges, the Jacksonville on gentle slopes, and the Heitt, Eden, and Fairmount on comparatively steep valley slopes. In the last three soils, because of erosion, greater loss of water by run-off, and less leaching, neutral or alkaline C material is at or near the surface, and very little soil development, other than a color profile, exists, whereas the Jacksonville and Bentonville soils have fairly well developed profiles, but not so well developed as the Maddox and Ellsberry soils, owing to more restricted drainage. Except in the Heitt, Eden, and Fairmount soils, the reactions of the various horizons are comparable to those given for Bratton silt loam.

The Maddox and Ellsberry soils, like the Bratton and Hagerstown, have dark-brown friable A_1 layers and light reddish-yellow A_2 layers.

Maddox silt loam has a brown friable silty clay loam B horizon which, at a depth of about 24 inches, rests on a mottled grayish-brown and yellowish-brown silty clay C horizon; whereas Ellsberry silt loam has a B horizon consisting of reddish-yellow silty clay loam, very much speckled in the lower part with red and yellow, and, in addition, containing numerous coatings, streaks, splotches, and concretions of manganese and iron material. The C horizon is reddish-yellow silty clay with gray mottlings.

In the Bentonville and Jacksonville soils gray and yellow colors predominate in the solum, instead of brown, red, and yellow, as in the Maddox and Ellsberry soils. The Jacksonville soil differs from the Bentonville in its higher content of shale material which impedes internal drainage, so that soil development has been more retarded, and its grayish-yellow B horizon is mottled with gray at a depth of 14 or 16 inches.

The Eden, Heitt, and Fairmount soils are all thin soils lying on rather steep slopes, but they differ in their color profiles. The Heitt soils have reddish-brown surface soils and subsoils; the Eden soils brownish-gray surface soils and olive-brown, olive-yellow, and yellowish-brown subsoils; and the Fairmount soils dark grayish-brown surface soils and olive-yellow or olive-gray subsoils. The Eden and Heitt soils have rather mellow pervious subsoils, whereas the Fairmount soils have plastic subsoils.

Other soils without distinctive profile development, except color, and belonging to the group of soils derived from residual limestone or calcareous shale material, are members of the Burgin and Otway series. Burgin silty clay loam occurs in depressions under very poor drainage conditions, where organic matter, in the presence of water, has accumulated in the surface soil, giving it a dark-gray color to a depth of 10 inches. The subsoil is highly mottled yellowish-brown and gray material, and the substratum, at a depth ranging from 7 to 8 feet, is dolomite with seams and lenses of calcareous shale. The Otway soils differ from Burgin silty clay loam in their occurrence on steep slopes, and in the fact that the surface soil has largely been washed away. Otway silty clay loam, the most extensive soil of the series, to a depth of 3 inches is very light brown silty clay loam. This is underlain by light grayish-yellow silty clay containing gray, yellow, and brown mottlings. This material rests on calcareous light grayish-yellow shale at a depth ranging from 12 to 30 inches.

Cincinnati silt loam is representative of the well-drained soils derived largely from glacial till consisting of limestone, dolomitic limestone, and calcareous shale materials. This soil occurs in the northwestern part of the county on ridges having strongly undulating and sloping relief. A typical profile of this soil may be described as follows:

A_0. A very thin layer of very dark forest mold and litter, which is neutral in reaction.

A_1. 0 to 1 inch, laminated friable dark grayish-brown silt loam which is neutral or alkaline in reaction.

A_{11}. 1 to 4½ inches, laminated friable grayish-brown silt loam which breaks into single grains, although numerous small lumps cling to rootlets when the soil mass is shaken out. The material is neutral in reaction.

A_2. 4½ to 13 inches, cream-colored, light yellowish-brown, or light grayish-yellow friable vesicular laminated silt loam which breaks down into

single grains. The material is acid in reaction. This is the layer in which maximum leaching has taken place. Root channels and worm holes contain material from the layer above.

B_1. 13 to 18 inches, a layer of light reddish-yellow or yellowish-brown light silty clay loam with a well-defined breakage. The material falls into small angular structure aggregates that range in diameter from one-eighth to three-eighths of an inch. As a rule, the color of the outsides of the aggregates is reddish yellow or reddish brown, but that of the insides is yellowish brown, and the powdered material is more yellow than that of a broken surface. The material is medium acid in reaction.

B_2. 18 to 35 inches, yellowish-brown silty clay loam which breaks into angular structure aggregates ranging from one-fourth to one-half inch in diameter. Manganese and iron stains, streaks, and concretions are common. The material is strongly acid in reaction.

B_{21}. 35 to 45 inches, yellowish-brown heavy silty clay loam having the maximum content of manganese and iron and breaking into structure aggregates ranging from three-eighths to five-eighths of an inch in diameter. The material is medium acid in reaction.

C_1. 45 to 65 inches, yellowish-brown silty clay with gray mottlings. Manganese and iron pellets and stains are less numerous than in the overlying horizon, and the material has no structure development. The yellowish-brown material is friable, but the gray material is plastic. The reaction is medium acid.

C_2. 65 to 80 inches, mottled yellowish-brown and gray silty clay which is alkaline in reaction. Some weathered irregular-shaped limestone fragments are present.

C_3. 80 to 90 inches, calcareous silty clay of the same color as the material in the layer above. Unweathered limestone fragments are present.

Throughout this soil and scattered over the surface are small glacial erratics consisting largely of quartzite, vein quartz, and granite gneiss.

Associated with the Cincinnati soils are soils of the Rossmoyne, Avonburg, Clermont, Edenton, Loudon, and Jessup series. Those of the first three series are like the Cincinnati soils, in that the entire soil is developed from glacial till, but in those of the last two, the lower parts of the profiles are of material residual from interstratified limestones and shales. The Edenton soils occur on steep valley slopes and are transitional between the Fairmount or Eden soils and the Cincinnati soils. In shallow valleys, or in sections where the till blanket is comparatively thick, the profiles of the Edenton soils are developed entirely from glacial till; but in deeper valleys, or where the till blanket is thin, the lower part of the soil is developed from material residual from interstratified shale and limestone. These soils have little profile development other than color, owing to the facts that run-off is great, leaching is limited, and erosion is active. The Clermont soils are gray. They occur on flats where a waterlogged condition prevails for long periods, thereby impeding soil development. At a depth ranging from 15 to 30 inches, there is a compact impervious layer.

The Rossmoyne soils occur on ridges and have somewhat less sloping relief than the Cincinnati soils. To a depth of 2 feet, their characteristics resemble those of Cincinnati silt loam, but below this depth they show the effects of restricted drainage and with increasing depth approach more and more the characteristics of the Clermont soils.

The Avonburg soils occur on broad ridges surrounded by Rossmoyne soils. As the result of more restricted internal drainage, the B horizon is thinner than that of the Rossmoyne soils, although drain-

age is less restricted than in the Clermont soils, owing to the small degree of surface slope and to the fact that the compact impervious layer is somewhat farther below the surface. The thickness of the B horizon is the result largely of drainage conditions, as evidenced by profiles along invading drainageways which have effected the drainage of parts of areas which were formerly Clermont silt loam, but later, because of better drainage, developed the Avonburg profile, subsequently a Rossmoyne profile, and ultimately the profile of the Cincinnati soils.

The Loudon soils resemble the Rossmoyne soils in relief, drainage, color of the various layers of the solum, and thickness of the B horizons; but they differ in having a somewhat heavier texture in the B and C horizons, a higher pH value throughout, and calcareous material within a depth ranging from 3 to 4 feet below the surface.

The Jessup soils, as regards degree of mottling and internal drainage, are between the Cincinnati and the Loudon soils, and have more red color throughout than either.

Of the soils of the Appalachian Plateaus section, which are derived from noncalcareous sandstones and shales and which are representative of a large area lying east and northeast of Adams County, Muskingum silt loam is the most representative. It occurs on narrow ridges and valley slopes with the relief ranging from gently rolling to steep. This soil does not show the characteristics common to the mature soils of the section but rather those characteristics which indicate that the soil-forming forces have been limited, due to the steep relief. The profile, or succession of layers, of Muskingum silt loam are described as follows:

A_0. A thin layer of partly decomposed roots with some leaf litter and trash.
A_1. 0 to ½ inch, dark grayish-brown friable silt loam.
A_2. ½ to 5 inches, laminated light grayish-yellow friable silt loam.
A_3. 5 to 8 inches, a transitional layer of grayish-yellow friable heavy silt loam which breaks into single grains.
B_1. 8 to 15 inches, grayish-yellow heavy silt loam.
B_2. 15 to 24 inches, brownish-yellow silty clay loam containing sandstone fragments.
C. 24 to 30 inches, light-yellow fine sandy loam. Along old root channels the iron has been reduced, leaving a gray coating. Angular sandstone fragments are common, and the material rests on partly disintegrated sandstone.

In association with the Muskingum soils are soils of the Rarden, Tilsit, Latham, Naceville, Colyer, and Fawcett series. The profiles of all these soils, because of their immaturity, have the impress of geologic material strongly stamped on them. The Rarden soils differ from the Muskingum chiefly in their light reddish-yellow color below the organic layer and in their reddish-yellow silty clay substratum; the Latham soils in their light grayish-brown A_1 horizons and their reddish-brown C horizons which consist of reddish-brown clay below a depth of 29 inches; the Naceville soils in their occurrence on high benches along streams and in a high content of gravel throughout the soil and parent materials which rest on gray shale at a depth ranging from 3 to 5 feet; the Colyer soils in their grayish-brown upper layers, yellowish-brown silty clay loam lower layers, and black shale substratum at a depth ranging from 12 to 20 inches; the Fawcett soils in their heavy-textured plastic soil materials which rest on gray

shale; and the Tilsit soils in their flat relief and poorly drained heavy-textured soil material.

The essential characteristics of a well-drained soil of the terraces are shown by the profile of Wheeling silt loam, as it occurs in a gravel pit 2 miles west of the Adams-Scioto County line on the Ohio River terrace:

A_1. 0 to 4 inches, brown or dark-brown micaceous silt loam.
A_2. 4 to 11 inches, yellowish-brown platy silt loam.
A_3. 11 to 17 inches, a transitional layer of yellowish-brown slightly blocky silt loam.
B. 17 to 24 inches, compact heavy micaceous silt loam which breaks into structure aggregates ranging from one-half to 1 inch in diameter.
C. 24 to 33 inches, brown heavy silt loam which is not so heavy and compact as the layer immediately above. This layer contains many small pores and root channels.
D_1. 33 to 68 inches, stratified beds of silt and very fine sand. This layer marks the lower limit of root penetration.
D_2. 68 to 108 inches, stratified beds of gravel, sand, and silt.

Other soils occurring on the Ohio River terraces belong to the Sciotoville, Ginat, and Chilo series; and the soils on the terraces along Ohio Brush Creek belong to the Williamsburg and Dunkinsville series. The soils on the Ohio River terraces are distinguished from those on the terraces along Ohio Brush Creek, in that the material of the various soil layers has a slick or greasy feel, owing to the presence of numerous small particles of mica.

The Sciotoville, Ginat, and Chilo soils differ from the other terrace soils, in that they occupy depressions. The Ginat and Chilo soils have developed no soil profile other than a color profile. The Sciotoville soil is mottled below a depth of 18 inches, indicating imperfect internal drainage; whereas the Ginat and Chilo soils have very restricted drainage throughout. The Chilo soil is unlike all other soils on the terraces, in that it has a high content of organic matter in its A horizon and a neutral or alkaline reaction throughout the entire soil mass.

The Dunkinsville soils are like the Wheeling soils in their good surface and internal drainage, but they differ from those soils in having a thicker and better developed B horizon which contains many manganese and iron concretions and coatings below a depth of 27 inches. The Williamsburg soils differ from both the Wheeling and the Dunkinsville soils in that drainage is restricted below a depth of about 24 inches, in that they are free of gravel throughout, and in that they do not rest on a gravel substratum. They differ further from the Dunkinsville soils in having thinner B horizons.

In the deposits constituting the stream flood plains definite soil characteristics have not developed. The well-drained soils of the flood plains, associated with upland soils derived from noncalcareous sandstones and noncalcareous shales of the Appalachian Plateaus, are classed as Pope soils, and the poorly drained as Philo soils. The Huntington soils are well-drained soils of the flood plains of Ohio Valley and, together with the poorly drained Lindside soils, are associated with upland soils derived from residual materials of limestones, dolomitic limestone, and calcareous shales. The Genesee soils are the well-drained and the Eel soils the poorly drained soils of flood plains, associated with upland soils derived from glacial materials.

SUMMARY

Adams County has a temperate continental climate with short periods of extreme heat and cold. The long warm summers are favorable for growing corn and tobacco, and the low temperatures of winter in general are not destructive to winter crops.

Physiographically the county includes parts of two well-known divisions—the Appalachian Plateaus, featured by high narrow ridges and deep valleys with steep slopes, in the eastern part; and the Interior Low Plateaus which comprise a plain, highly dissected for a distance of several miles back from the valley of Ohio River, but with more shallow valleys and lower ridges ranging from one-fourth to 1 mile in width in the central and western parts, and undulating to gently rolling relief in the northwestern quarter, where a blanket of glacial till (Illinoian) covers the area.

In the Appalachian Plateaus section, noncalcareous sandstone caps the ridges, and both noncalcareous sandstone and noncalcareous shale occur on the slopes; whereas in the Interior Low Plateaus section, limestone, in the southwestern part of the county, and dolomitic limestones in the central and northern parts, cap the ridges, and calcareous shale or interstratified calcareous shale and limestone underlie the slopes. The glacial till, covering the rest of the county, is a mixture of heterogeneous materials consisting largely of silt and clay, with some sand, crystalline erratics, and irregular limestone fragments.

The county is within the region of Gray-Brown Podzolic soils. The land was heavily forested with mixed hardwood and some pine in the Appalachian Plateaus section and mixed hardwoods over the rest. Under forest conditions only a small quantity of organic matter has accumulated in the soils, therefore the colors are prevailingly light.

The well-drained soils of the ridges and terraces along streams are podzolic. Those derived from residual limestone, dolomitic limestones, or calcareous shale materials are leached of their carbonates to a depth ranging from 4 to 5 feet, and those derived from glacial till or stream terrace materials to a depth ranging from 6 to 11 feet; but in those soils derived from noncalcareous sandstone or noncalcareous shale materials, there are no carbonates.

In the Interior Low Plateaus section, on steep valley slopes, where erosion has kept pace with soil development, the surface soils are best supplied with mineral elements and are naturally the most productive; but owing to their relief, heavy texture, and plastic subsoils, considerable difficulty is experienced in handling them.

Soils occurring on flood plains rank among the best for corn, tobacco, and truck crops, because of their high content of mineral elements and organic matter.

For purposes of study and discussion, the soils of the county are placed in five broad groups on the basis of natural soil characteristics. The groups correspond, in a general way, to the productivity and use of the land, although these are modified to some extent by the relief of the land and the character of the parent soil materials. These groups are:

(1) Brown well-drained soils of the uplands.
(2) Grayish-brown soils of the uplands.

(3) Gray poorly drained soils of the uplands.
(4) Brown soils of the terraces and bottom lands.
(5) Grayish-brown poorly drained soils of the terraces and bottom lands.

Agriculture centers about the production of corn, tobacco, wheat, and hay. The corn and hay are fed to livestock on the farms, and tobacco and wheat are cash crops. The preference for these crops is, to a marked degree, controlled by soil adaptability. For corn and tobacco, those soils are most desirable that are the least leached of their mineral elements, have a fair supply of organic matter, and good drainage. Such soils occur on eroded slopes over formations of limestone, dolomitic limestone, interstratified limestone and calcareous shale, and neutral or calcareous glacial till; and in the flood plains of streams. The soils of the flood plains, owing to inundation, are not used so extensively for tobacco as for corn. Wheat grown on the soils of the steep slopes and flood plains returns some of the best yields, but it has a tendency to develop a long thin straw which causes lodging, and this, together with a strong preference of farmers to use these better soils for corn and tobacco and the inadaptability of the soils on steep slopes to the use of harvesters, prompts the farmers to commonly favor the brown or brownish-gray soils of the ridges, gentle or moderate slopes, and terraces, where erosion has not been serious, for wheat, although leaching has removed considerable of the mineral elements, and the content of organic matter is low. A large part of the hay produced follows wheat in the rotation, because wheat is a good nurse crop.

The soils derived from noncalcareous sandstone and noncalcareous shale materials are used for corn, wheat, and hay, but they have lower producing capacities than those derived from limestone, dolomitic limestone, calcareous shale, and glacial till materials, owing to a lower content of mineral elements and organic matter, and because they are very acid in reaction.

The well-drained gravelly soils of the flood plains are among the best in the county for corn and tobacco because of their open well-aerated subsoils and comparatively high content of both mineral elements and organic matter.

Dairying is the most important branch of agriculture Raising and fattening hogs for market ranks second. The production of corn and hay is largely in support of these activities.

Authority for printing soil survey reports in this form is carried in the Appropriation Act for the Department of Agriculture for the fiscal year ending June 30, 1933 (47 U. S. Stat., p. 612), as follows:

There shall be printed, as soon as the manuscript can be prepared with the necessary maps and illustrations to accompany it, a report on each soil area surveyed by the Bureau of Chemistry and Soils, Department of Agriculture, in the form of advance sheets bound in paper covers, of which not more than two hundred and fifty copies shall be for the use of each Senator from the State and not more than one thousand copies for the use of each Representative for the congressional district or districts in which a survey is made, the actual number to be determined on inquiry by the Secretary of Agriculture made to the aforesaid Senators and Representatives, and as many copies for the use of the Department of Agriculture as in the judgment of the Secretary of Agriculture are deemed necessary.

Areas surveyed in Ohio shown by shading. Reconnaissance surveys shown by northwest-southeast hatching; crosshatching indicates areas covered by both detailed and reconnaissance surveys.

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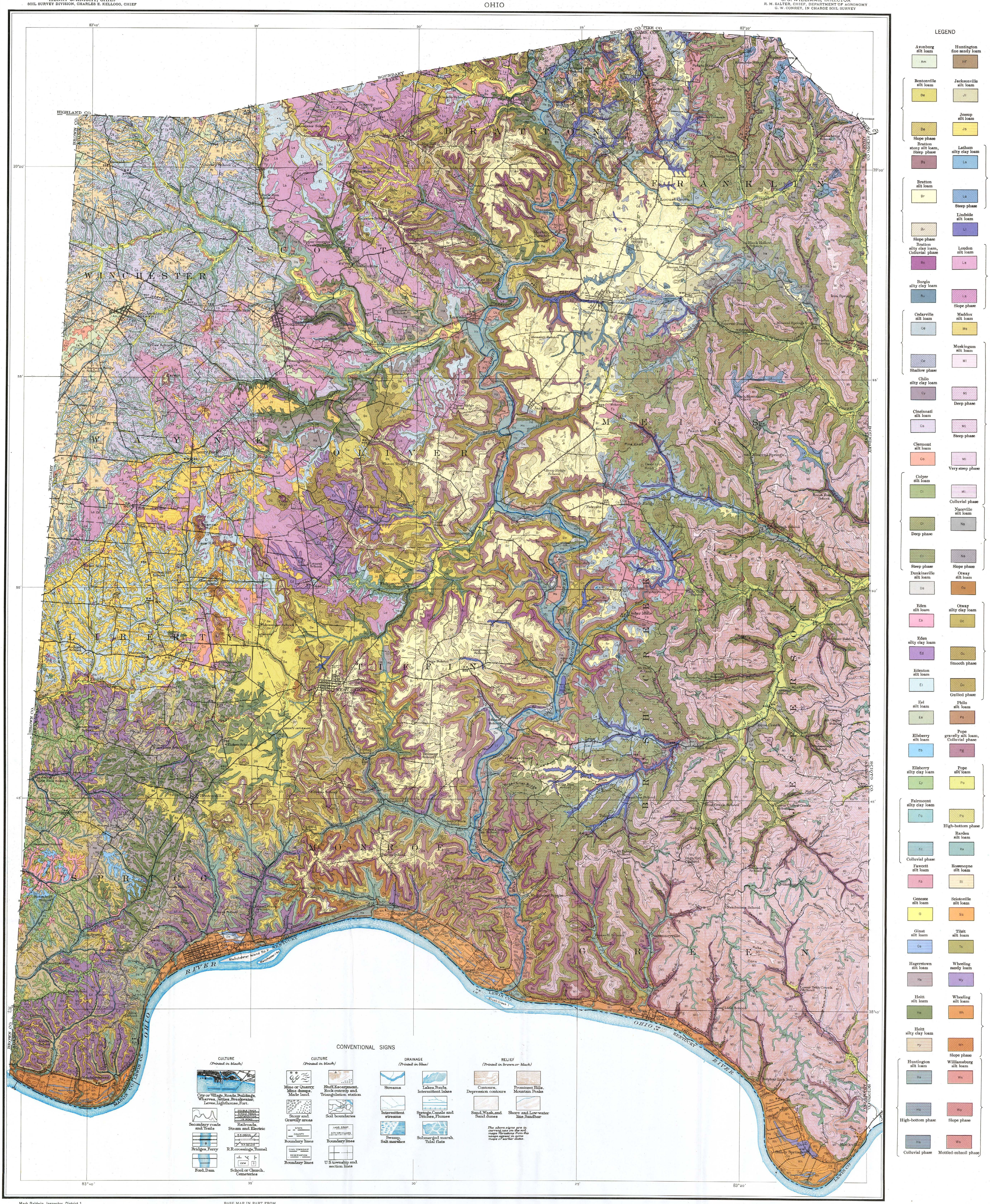
HENRY G. KNIGHT, CHIEF
SOIL SURVEY DIVISION, CHARLES E. KELLOGG, CHIEF

SOIL MAP
ADAMS COUNTY
OHIO

OHIO AGRICULTURAL EXPERIMENT STATION
C. G. WILLIAMS, DIRECTOR
R. M. SALTER, CHIEF, DEPARTMENT OF AGRONOMY
G. W. CONREY, IN CHARGE SOIL SURVEY



Mark Baldwin, Inspector, District 1.
Soils surveyed by Arthur E. Taylor, in charge, J. T. Miller, W. E. Tharp and Earl D. Fowler, U. S. Department of Agriculture, and T. C. Green and G. W. Conrey, Ohio Agricultural Experiment Station.

BASE MAP IN PART FROM
U. S. GEOLOGICAL SURVEY SHEETS

Scale $\frac{1}{62500}$
Miles
Kilometers
Contour interval 20 feet.
Datum is mean sea level.

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Field Operations
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